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ENVIRONMENTAL ASSESSMENT

PREDATOR DAMAGE MANAGEMENT IN COLORADO

Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE ANIMAL AND PLANT HEALTH INSPECTION SERVICE WILDLIFE SERVICES

in cooperation with:

Colorado Department of Agriculture Colorado Division of Wildlife Bureau of Land Management U.S. Fish and Wildlife Service U.S. Forest Service

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ACRONYMS U	ISED
ACEC	Area of Critical Environmental Concern
AGL	Above Ground Level
ANG	Air National Guard
APHIS	Animal and Plant Health Inspection Service
AUM	Animal Unit Month
BISON-M	Biota Information System of New Mexico
BLM	Bureau of Land Management
BO	Biological Opinion
CDA	Colorado Department of Agriculture
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
CFR	Codes of Federal Regulations
CRS	Colorado Revised Statutes
DAU	Data Analysis Unit
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FLPMA	Federal Land Policy Management Act
FONSI	Finding of No Significant Impact
FPA	Future Planning Area
FY	Fiscal Year
GAV	General Aviation
GMU	Game Management Unit
IWDM	Integrated Wildlife Damage Management
LRMP	Land and Resource Management Plan
LTO	Long Term Objective

MIS Management Information System

MOA Military Operation Area

MOUMemorandum of UnderstandingMUSYAMultiple-use Sustained Yield ActNASSNational Agriculture Statistics ServiceNEPANational Environmental Policy Act

NF National Forest

NFMA National Forest Management Act

NG National Grassland

NHPA National Historical Preservation Act
PDM Predator Damage Management

RA Resource Area (BLM)
RMP Resource Management Plan
SMA Special Management Area
SOP Standard Operating Procedure
T&E Threatened and Endangered
UCI Upper Confidence Interval

USC U.S. Codes

USDA U.S. Department of Agriculture

USFS U.S. Forest Service

USFWS U.S. Fish and Wildlife Service

WA Wilderness Area

WDM Wildlife Damage Management
WHHMA Wild Horse Herd Management Area

WP Work Plan
WS Wildlife Services
WSA Wilderness Study Area

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

While wildlife including mammalian predators is a valuable natural resource, some species of wildlife can cause problems with human interests. The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program has personnel with expertise to respond to damage caused by wildlife, including mammalian predators. Most predators from the order Carnivora and the Virginia opossum (Didelphis virginianus) are part of Colorado's wildlife heritage including 20 native and 3 introduced/feral species that have the most likely potential to cause damage to resources in Colorado. WS conducts predator damage management (PDM) for several of these species. The species in Colorado that cause frequent damage to agricultural and natural resources, property, or threaten human health and safety include coyotes (Canis latrans), black bears (Ursus americanus), mountain lions (Felis concolor), striped skunks (Mephitis mephitis), red fox (Vulpes vulpes), raccoons (Procyon lotor), and feral/free roaming dogs (Canis familiaris). Other predators in Colorado that have caused only localized damage on an occasional to annual basis, and at least once in the last 5 federal fiscal years (FY00-FY04; i.e., FY04 = Oct. 1, 2003 -Sept. 30, 2004) include bobcats (Lynx rufus), feral/free roaming cats (Felis domesticus), badgers (Taxidea taxus), gray fox (Urocyon cinereoargenteus), opossums, western spotted skunks (Spilogale gracilis), and long-tailed weasels (Mustela frenata). WS has provided very limited operational PDM or technical assistance for these species. In addition, Colorado has a few other predators that could invoke complaints, but none of these species created problems in the last 5 FYs that WS responded to. These species include kit fox (Vulpes macrotis), swift fox (V. velox), ringtails (Bassariscus astutus), marten (Martes americana), mink (Mustela vison), ermine (M. erminea), feral domestic ferrets (M. putorius furo), eastern spotted skunks (Spilogale putorius), and hog-nosed skunks (Conepatus mesoleucus). PDM could be initiated to target any of the above species and will be covered in this Environmental Assessment (EA) per the National Environmental Policy Act (NEPA).

The Colorado Division of Wildlife (CDOW) manages the above species populations with the exception of feral domestic pets (they have regulations allowing the take of feral dogs) and T&E species, except as authorized by the U.S. Fish and Wildlife Service (USFWS). The species managed by CDOW are classified as game animals or furbearers under Colorado statutes. Game animals include the black bear and mountain lion. Furbearers with current hunting seasons include the badger, bobcat, coyote, red fox, raccoon, and striped skunk. Furbearers with no current hunting seasons include gray fox, swift fox, kit fox, marten, mink, opossum, ringtail, hog-nosed skunks, spotted skunks, and weasels. CDOW is responsible for damage caused by these species to property, natural resources, and human health and safety, with the exception of feral animals under most circumstances. The Colorado Department of Agriculture (CDA) is responsible for damage to agriculture (e.g. livestock, crops, rangeland, and pasture) by coyotes, wolves, foxes, bobcats, raccoons, mountain lions, bears, striped skunks, and opossums. Some human health and safety problems are the responsibility of the Colorado Department of Public Health and Environment (CDPHE). Private persons or entities can take these species under a CDOW permit, and under certain circumstances, people can take depredating wildlife without a permit.

The following document is an EA that describes and analyzes WS's involvement in PDM in Colorado. For the purposes of this EA, predatory mammals are defined as those species listed above. While CDOW is clearly responsible for native wildlife species' populations (20) and much of their damage, WS assists them with PDM. WS also assists CDA, a primary cooperator by statute, CDPHE, Tribes, other federal agencies, and public entities with PDM. Therefore, WS is providing the following analysis to determine if WS has any significant impacts on these species or the human environment as a result of conducting PDM. This EA will be used in a decision-making process to determine if WS should continue to provide PDM, some modified PDM program, or not provide any PDM at all. Although WS has federal authority to conduct wildlife damage management (WDM), WS also has a policy of abiding by state laws and has agreed to be consistent with any management directions or plans that CDOW, CDA, and CDPHE have established on behalf of the State as applicable to WS authorities.

Several other species of mammalian predators are found in Colorado and include listed sensitive or threatened and endangered (T&E) species. These include three species that were believed to be extirpated in Colorado, the State threatened river otter¹, the federally endangered black-footed ferret, and federally threatened lynx which have been reintroduced back into Colorado. The endangered Mexican gray wolf, the native population believed to be extirpated from the United States, has been reintroduced in western New Mexico and eastern Arizona as a nonessential, experimental population and could potentially expand their population northward. The threatened gray wolves, reintroduced into the Yellowstone tri-State area, could potentially disperse into Colorado and start a population. The dividing line for the two species in Colorado is north and south of I-70, an arbitrary boundary set to insure that these species are provided adequate protection. The wolverine and grizzly bear possibly still exist, but likely have been extirpated from the State. PDM could be initiated to target these species, but would be covered in other NEPA documentation pursuant to this EA.

1.1.1 Background

Across the United States, wildlife habitat has substantially changed as human populations have expanded and land has been transformed to meet varying human needs. These changes often compete with wildlife and have inherently increased the potential for conflicts between wildlife and people. Some species of wildlife have adapted to and thrive in the presence of humans and the changes that have been made. These species, in particular, are often responsible for the majority of conflicting activities between humans and wildlife. The programmatic USDA-APHIS-WS Final Environmental Impact Statement (hereinafter referred to as USDA 1997) summarized the relationship in American culture of wildlife values and wildlife damage in this way:

"Wildlife has either positive or negative values, depending on varying human perspectives and circumstances... Wildlife generally is regarded as providing economic, recreational and aesthetic benefits..., and the mere knowledge that wildlife exists is a positive benefit to many people. However,... the activities of some wildlife may result in economic losses to agriculture and damage to property... Sensitivity to varying perspectives and values is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural, and economic considerations as well."

USDA is authorized and directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for WS is the Animal Damage Control Act of 1931 (7 U.S. Codes (USC) 426-426c; 46 Stat. 1468), as amended in the FY01 Agriculture Appropriations Bill (see Section 1.6.1). To protect American resources, WS conducts WDM. The following EA describes a portion of this responsibility, PDM. Much information will be given here, but additional information will be referenced in the EA. The Council on Environmental Quality (CEQ) regulations for implementing NEPA authorize agencies to eliminate repetitive discussions of issues addressed in programmatic Environmental Impact Statements by tiering to the broader documents (40 CFR (Code of Federal Regulations) 1500.4(1); 1502.20). Thus, this EA incorporates relevant discussions and analysis from USDA (1997) and includes discussions of the methods specifically used by WS in Colorado. USDA (1997) may be obtained by contacting the USDA, APHIS, WS Operational Support Staff at 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

WDM is defined as the alleviation of damage or other problems caused by wildlife (Leopold 1933, The Wildlife Society 1990, Berryman 1991). WS uses an Integrated WDM (IWDM) approach as defined in USDA (1997). This includes nonlethal strategies such as the modification of the habitat or offending animal's (s') behavior, and control of the offending animal(s) or local population of the offending species with lethal or nonlethal methods (USDA 1997). The

Scientific names for T&E species are given in Table 7.

goal of IWDM is to stop wildlife damage or reduce it to a tolerable level. Wildlife damage is also reduced via state hunting and trapping seasons that maintain predator populations at reduced levels. Without hunting and trapping it is estimated that wildlife damage would increase from \$20 billion to \$70 billion in the United States and people would become less tolerant of wildlife (International Association of Fish and Wildlife Agencies 2004).

WS's mission, developed through a strategic planning process (APHIS 2004), is to "... provide Federal leadership in managing problems caused by wildlife. WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can damage agricultural and industrial resources, pose risks to human health and safety, and affect other natural resources. The WS program carries out the Federal responsibility for helping to solve problems that occur when human activity and wildlife are in conflict with one another." This is accomplished through:

- training of wildlife damage management professionals;
- development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
- the collection, evaluation, and dissemination of management information;
- cooperative WDM programs;
- informing and educating the public on how to reduce wildlife damage; and
- providing technical advice and a source for limited-use management materials and equipment such as cage traps.

WS' Policy Manual² reflects this mission and provides guidance for engaging in WDM activities. WS cooperates with land and wildlife management agencies, when appropriate and as requested, to combine efforts to effectively and efficiently resolve wildlife damage problems in compliance with all applicable federal, state, and local laws and Memorandums of Understanding (MOUs) between WS and other agencies. Before WDM is conducted, *Agreements for Control* must be executed by WS and land owners/administrators, or *WS Work Plans* established in consultation with federal land management agency representatives. At the State level, WS has current MOUs or similar documents with CDA, CDOW, and CDPHE that specify roles and functions of each agency with regards to WDM. The MOUs with CDA and CDOW specifically address which agency is responsible for the different species causing damage and for what types of damage. National level MOUs have been signed between WS and the Bureau of Land Management (BLM) and U.S. Forest Service (USFS) that transferred the responsibilities for WDM and related compliance with NEPA from BLM and USFS to WS when WS is conducting PDM in response to requests from permittees on their lands, as appropriate.

1.1.2 The Colorado WS Program

WS responds to wildlife damage complaints from cooperators ranging from private citizens to other agencies. The biggest portion of the WS program in Colorado is to resolve conflicts between coyotes and livestock and is reflected in the number of requests that WS receives. WS has received requests for assistance for damage caused by 14 predators from FY00 to FY04 (Table 1) with the coyote being responsible for the majority of these requests. WS has not received any requests for assistance for the other 9 species covered in this EA in the past 5 FYs; however, the need could arise to assist with management projects for these species.

WS conducts PDM in cooperation with several other agencies in Colorado. CDA is a primary cooperator with WS for predators because they have the authority to establish cooperative programs with WS and counties in Colorado. WS and CDA have an MOU which lists responsibilities and authorities as they relate to PDM. Under the MOU, WS has the authority to respond to all damage requests involving agricultural endeavors from predators. CDOW has management authority over predators causing damage to non-agricultural property or when they are considered nuisance animals. CDOW issues depredation permits to take big game and furbearers and documents the use of restricted methods such

WS Policy Manual - Provides guidance for WS personnel to conduct WDM activities through Directives. WS Directives referenced in this EA can be found in the manual but will not be referenced in the Literature Cited Section.

as leghold traps and snares for a 30-day period on private lands. WS acts as an agent for entities requesting assistance with agricultural depredations and for private individuals that request assistance in reducing damage to private property. CDPHE has management authority over predators when they are impacting human health and safety and prohibited methods are needed to resolve a particular problem. WS cooperates and acts upon requests from the CDPHE when necessary.

Table 1. Requests for WS PDM assistance from FY00 to FY04 from the public and agencies to protect different categories of resources from damage by predators.

	O D	AMA	GE O	CCUR	RENCE	ES IN	IVOL	VING	PREI	ATO	SS RE	CORE	EDB	Y WS	NC	DAMAGE OCCURRENCES INVOLVING PREDATORS RECORDED BY WS IN COLORADO FROM FY00 TO FY04	ADO F	ROM	FY00	TOF	Y04				
Resource Category		Agr	Agriculture	re			Pro	Property		T	lumar	Healt	Human Health and Safety	Safet	y	Natu	ral Re	Natural Resources	SS			Total			Ave
Fiscal Year	00	0.1	0.2	0.3	04	0.0	10	02 (03 (04	00 01		02 03	3 04	00	101	0.2	03	F 0	00	0	0.2	0.3	0.4	
Badger	-	1	ı		_			2	1	-	ı		-	-	'	-	' 	•			_	2		1	_
Black Bear	152	190	198	94	146	2	2	2	2	1	3	3 -	-		1	ı	1	'	Ŀ	256	195	200	96	147	179
Bobcat	2		6	9	3		1	1	ı	_	-	'	- 1	1	'	'	-	2	,	2	0	6	6	3	5
Feral Cat	-		,	1	,	,	ı	-	,			1	-	5	'	-	•	-	-	0	-	0	0	5	-
Coyote	589	486	416	257	317	-	3	4	9	4	10	6 3	3 2	2	<u>'</u>		1	-	-	599	496	423	265	324	421
Feral Dog	25	27	9	6	7	-	1	_		ı	2	3 1	1	1	1	-	'	-	í	28	30	7	01	7	16.
Gray Fox	,	1	2	-	1	۱ :	1	-	_	ı	_			•	'	-	1	1	-	0	0	2	0	-	-
Red Fox	14	25	-	7	14		5	_	_	2	24 1	11 2	2 1	1	-	t	1	-	,	38	41	14	∞	17	24
Mountain Lion	75	46	44	34	31	-		3	3		2	9	5 -	_	-	•	•	-	-	77	52	52	37	32	50
Opossum	-	ı	,	-	ı	1						,	' '	ł	'	-	•	-	-	2	0	0	0	0	0
Raccoon	9	5	12	3	10	1		4	9	7	44			_		1	1	-	,	51	16	18	10	18	23
W. Spotted Skunk		-	,	1	-		,	1	1	-	,		-	. '	1	_	-	ı	,	0	_		0	0	0
Striped Skunk	_	3	5	2	,	5	2	3	9	3	33 2	25 2	27 27	7 38	- 8		-	,	-	39	30	35	35	41	36
Long-tailed Weasel	ı	2	-	,	٠	1	_		\neg		,	_	'	1	<u>'</u>	ľ		-	-	0	2	0	0	0	0
Total	964	784	703	413	530	6	12	. 61	23	16 1	119 (66 4	40 33	3 49				2		1,09	863	763	471	596	757
Average			619					16		П		61	1				-			Щ		757			

WS is a cooperatively funded, service-oriented Program. Cooperators range from private citizens to other agency personnel. Besides the State agencies, WS also cooperates with many counties in Colorado and focuses most PDM efforts in these areas where funding allows for staffing. WS generally conducts limited work in noncooperating counties, but may consider more projects as funding becomes available from interested governmental agencies and private individuals.

6

Colorado encompasses about 104,000 mi² (66,635,566 acres) in 64 Counties (Figure 1). The State is divided into 2 WS Districts: Grand Junction (northwestern Colorado) and Pueblo (southern and eastern Colorado). WS receives requests for PDM throughout Colorado. At a minimum, all requesters are provided with technical assistance (self-help information). Operational assistance is primarily provided in the counties that are shaded in Figure 1; however, assistance may be provided anywhere in Colorado where a need exists and funding is available to cover such actions.

WS personnel receive requests to conduct PDM throughout the various counties and Districts on private, federal, state, Tribal, county, and municipal lands. Colorado is comprised of about 55% private, 22% USFS, 13% BLM, 5% State, 3% other federal agency, 2% Tribal, and less than 1% local government lands. As of the end of January 2005, WS had active cooperative agreements in place on approximately 12.6 million acres or about 19% of the State's total land area.

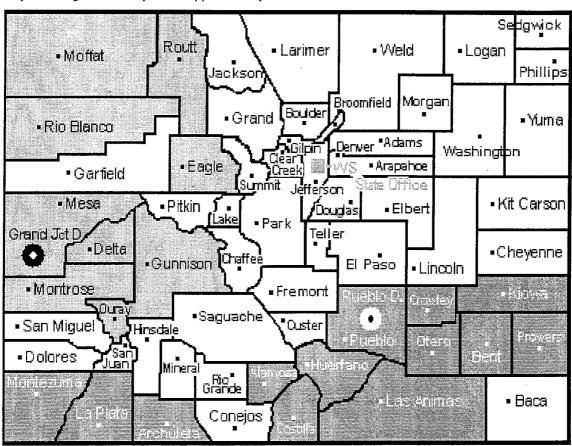


Figure 1. Colorado WS has a State Office in Lakewood (gray square) and District Offices in Grand Junction (white in black dot) and Pueblo (black in white dot). Shaded counties have cooperative programs with WS where WS Specialists respond to predator damage, although WS may respond to predator problems anywhere in the State.

The majority of property under agreement for PDM is privately owned (45%). Lands under agreement as of January 2005 were 5.6 million acres of private lands, 4.1 million acres of BLM administered lands, 2.0 million acres of USFS lands, 0.7 million acres of Tribal lands, and less than 0.2 million acres of other lands (State, USFWS, local government (county and city), and military).

Even though active agreements are in place for 19% of the lands in Colorado, WS does not conduct PDM activities on every property under agreement each year. For example in FY04, WS took target predators for PDM on properties totaling 2.4 million acres (4% of the land in Colorado) with 60% of that acreage consisting of private lands, 28% BLM lands, 10% USFS lands, and 1% other lands (State, Tribal, and local government). WS also does not work continuously throughout the year on these properties and generally spends only a few hours or days on any specific property during the year resolving damage problems. Additionally, WS PDM is typically only conducted on a small portion of a property under agreement. For example, WS in New Mexico (WS 1997a) prepared a special nonroutine compilation of the specific pasture areas within areas under WS agreement on which PDM lethal methods were expected to be used in the Albuquerque WS District. That analysis indicated the actual area impacted was less than 1/5 of the total area under agreement. Although a similar compilation is not available for the Colorado WS program, this indicates that less than 1% of the land area of the State actually is exposed to some level of WS PDM activity during a year's time. For example, an entire property under a WS agreement may contain 6,400 acres, but the WS Specialist determines there is only a need to work in a particular area that covers no more than 1 mi² or 640 acres because damage occurred in one area. Under that scenario, PDM is conducted on only one-tenth of the land under agreement. Therefore, WS PDM actions only occur on a small fraction of the land area in the State and would therefore impact only a small proportion of the predator populations. Information on agreement acreage as well as predators taken and other information is kept in a management information system (MIS3). Colorado WS does not anticipate that the percentage of lands under agreement would increase substantially over the next five to ten years and at most would work on 20% of the lands as indicated by the agreements in place.

1.2 PURPOSE

This EA evaluates a portion of WS's responsibility to protect resources in Colorado. Specifically, this EA addresses mammalian PDM for the protection of a variety of resources throughout Colorado; predators include a range of species that prey on livestock and wildlife, damage property and other resources, or threaten human health and safety.

WS has MOUs with CDA, CDOW, and CDPHE that outline the cooperative relationship between these agencies and WS, and the responsibilities for each agency when responding to PDM requests for the different species they manage. Feral dogs, cats, and ferrets are managed under the authority of State, county, and municipal laws and WS responds to complaints involving them only at the request of the appropriate Animal Control Office, County Sheriff, Health Department, or managing agency; if the agency wants assistance with a problem, WS gets an agreement or approval to work, at that time. WS refers complaints involving T&E species to USFWS, unless directed otherwise in an MOU; none of the predators covered under this EA are federally listed T&E species, but WS, under the direction and guidance of USFWS, may respond to complaints involving these species under provisions of the Endangered Species Act (ESA) and NEPA documentation pursuant to this.

The analysis in this EA includes a major effort to consider existing data contained in other NEPA and related documents. WS completed two PDM EAs (WS 1997b, 1999a) for eastern and western Colorado. WS has also completed monitoring reviews to determine if the work being conducted remained within the scope of the EAs. If new substantive issues arise or the analysis in a monitoring review concludes that WS PDM activities are outside the scope of an EA, then additional NEPA documentation is prepared. For example, the EA may be supplemented, as necessary, to include the new information and sent out for public review. New Findings of No Significant Impact (FONSI), as appropriate, and Decisions are then released. The Western Colorado EA (WS 1997b) was supplemented and included a new FONSI and Record of Decision (WS 2001). Much of the data from the EAs (WS 1997b, 1999a) and monitoring reports will be included in this EA. This EA is an effort to combine the 2 EAs into one comprehensive statewide EA to provide a more uniform approach for PDM throughout the State. It has been found in other State WS Programs (WS 1999c) that a

MIS - Computer-based Management Information System used by WS for tracking Program activities. WS in Colorado has had the current MIS system operational since FY 94. Throughout the text, data are generally on a federal fiscal year basis (e.g., "FY 04" which is the period October 1, 2003 through September 30, 2004).

comprehensive EA has provided a more usable working tool for coordination with all cooperating agencies and promotes consistency in PDM activities by WS throughout the State. In addition to incorporating the WS PDM EAs for Colorado (WS 1997b, 1999a, 2001), this EA is tiered to USDA (1997). This EA and its final Record of Decision supercedes previous EAs and FONSIs (WS 1997b, 1999a, 2001) for Colorado PDM.

Normally, according to the APHIS procedures for implementing NEPA, individual WDM actions are categorically excluded (7 CFR 372.5(c), 60 Fed. Reg. 6,000-6,003, 1995). The prior EAs referenced herein (WS 1997b, 1999a) and this EA have been prepared to facilitate planning and interagency coordination, to streamline program management, and to clearly communicate with the public the analysis of cumulative impacts. The WS program has previously determined that an environmental impact statement was not required (WS 1997b, 1999a, 2001) and that preparation of an EA for WS PDM on all land classes in Colorado complies with NEPA, and with CEQ (40 CFR 1500) and APHIS NEPA implementing regulations (7 CFR 372).

1.3 NEED FOR ACTION

Predators are responsible for the depredation of a wide variety of livestock, other agricultural resources, property and natural resources. In addition, predators can be a threat to human health and safety (e.g. in January 2004, a 35-year-old amateur mountain bike racer was killed by a mountain lion in California). Table 1 shows the requests for assistance by category over the last 5 FYs (FY00-FY04). Requests for assistance are an indication of need, but the requests that WS receives likely represent only a portion of the need in actuality. Connolly (1992) determined that only a fraction of the total predation attributable to coyotes is reported to or confirmed by WS. He also stated that based on scientific studies and recent livestock loss surveys generated by the National Agriculture Statistics Service (NASS), WS only confirms about 19% of the total adult sheep and 23% of the lambs actually killed by predators. WS Specialists do not attempt to locate every livestock kill reported by ranchers, but rather make attempts to

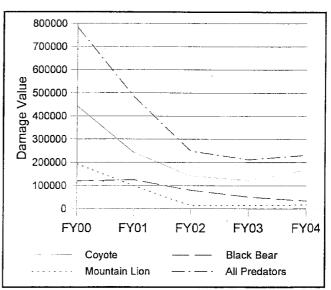


Figure 2. Total dollar value of damage caused by coyotes, black bears, mountain lions, and all predators combined as reported by requesters of WS PDM assistance in Colorado during FY 00-FY 04.

verify sufficient losses to determine if a predator problem exists that requires PDM actions. Therefore, WS's loss reports do not actually reflect the total number of livestock lost in the State, but provides an index of the annual losses. Also, some people are unaware of the WS Program and may try to resolve problems themselves or CDOW may choose to handle certain depredation problems caused by furbearers or game animals without requesting WS assistance. The total number of requests for assistance reflected in damage occurrences have remained fairly stable since prior PDM EAs were written (WS 1997b, 1999a).

The total value of the resources damaged can give an indication of the need for PDM, but is not always the best indicator of the overall need. The value can be variable depending on the ability of a particular predator to inflict damage and the type of resources being damaged. For example, one black bear may kill 40 sheep in just a few nights or it may kill a registered thoroughbred foal, resulting in thousands of dollars damage for just one incident. Value and requests for assistance are often more of an indicator of the focus of WS PDM because many requesters know that WS will respond to their needs for certain species.

The combined total value for damage caused by all predators has mostly reflected coyote, black bear, and mountain lion damage, averaging 57%, 21%, and 17% (95% of total damage), respectively, of the combined damage annually for all mammalian predators from FY00 to FY04. The value of damage caused by predators that is documented by WS is often

related to the number of requests for assistance received for a particular species. However, differences can be noted between species, primarily because larger species often cause much more damage with a higher value in one incident than species that are smaller (i.e., black bears and dogs vs. striped skunks and feral cats). Figure 2 gives the value of damage for coyotes, black bears, and mountain lions, and damage combined for all predators in Colorado from FY00 to FY04 (these 3 species coincidentally were responsible for the most requests for assistance). Damage for coyotes has decreased, but mostly reflects typical fluctuations in damage due to conditions that have been discussed in Section 1.3; coyotes cause the most damage annually of all mammalian predators. Black bears have fairly consistently caused the second most damage reported to WS in Colorado, and are generally about a third of the damage reported to be caused by coyotes. Mountain lion damage has remained relatively stable in comparison to the level of coyote damage at less than a third of the value, but like coyote damage has shown a decreasing trend (typical of fluctuations in damage). Coyote and mountain lion damage were high, though, in FY00; this is likely more an indication of fewer animals harvested by sport hunters and suitable climatic conditions to have high juvenile survival. Feral dogs, raccoons, and red fox cause the next most damage at 2%, 1%, and 1%. Other than these six predators which account for over 99% of the damage value as well as over 99% of the requests for assistance, damage for the remaining seventeen predators in Colorado combined is typically less than 1% of the total value of damage and less than 1% of the requests for assistance.

PDM is conducted to protect agricultural and natural resources, property, and human health and safety from predators. PDM has been conducted since the 1920s in Colorado by WS. Over the last 5 FYs (FY00 to FY04), WS has documented an average of 757 requests from the public and other agencies annually to resolve problems associated with mammalian predators (Table 1). Requests decreased from 1,093 in FY00 to 471 in FY03, but started to increase again in FY04. The majority of requests, 90%, is to protect agricultural resources followed by 8% of requests to protect human health and safety. Seven species have been responsible for 99% of the requests for assistance including coyotes (56%), black bears (24%), mountain lions (7%), striped skunks (5%), red fox (3%), raccoons (3%), and feral dogs (2%). An additional 7 species of predators in Colorado have only been responsible for 1% of the requests for assistance during the last 5 FYs.

As discussed previously, WS has not received any requests in recent years to resolve damage problems caused by 9 other predator species not shown in Table 1, and we expect few, if any, requests for assistance concerning those species in any year. Normally responses to such limited and rare-occurrence requests are categorically excluded. We have chosen to cover these species within the scope of this EA to facilitate quick and efficient responses by WS to such rare and occasional requests.

1.3.1 Summary of Proposed Action

The proposed action is to continue the current program of WS PDM activities in Colorado for the protection of livestock, crops, property, natural resources, and human health and safety as outlined in prior WS EAs (WS 1997b, 1999a, 2001). The objective of PDM as conducted in the proposed action is to minimize loss or the risk of loss to the above resource categories from predators by responding to all public requests with technical assistance (advice or demonstrations) or direct control. WS employees provide technical assistance to resource owners covering a variety of methods that can be used to resolve problems where it is appropriate for the resource owners to resolve the problem or part of the problem themselves. WS also assists resource owners through educational programs on damage identification, prevention, and control, and by providing information on sources of supply for PDM products such as pyrotechnics and propane cannons or by temporarily loaning supplies such as cage traps⁴.

Direct (also referred to as "operational") control support has been mostly provided for situations that require the use of methods and techniques that are difficult or dangerous for the public to implement, especially those that involve lethal control measures, and where WS's expertise in PDM is of value. Direct PDM efforts often require costly expenditures for supplies and staff hours and, therefore, are generally limited to situations where cooperative funding is available. Resource owners that are given direct PDM support are also encouraged to use additional management strategies and

WS technical assistance is educational, informational, advisory or consultative in nature and is categorically excluded from the need to prepare an environmental assessment or environmental impact statement (7 CFR 1b.3(a)).

sound husbandry practices, when and where appropriate, to further reduce conflict situations.

Under the proposed action, IWDM would be implemented which encourages the use of all available legal techniques and methods, used singly or in combination, to meet the needs of the requesters for resolving conflicts with predators. Most wildlife damage situations require professional expertise, an organized control effort, and the use of up to several of the available PDM methods to sufficiently resolve them. WS personnel, who are trained professionals and equipped to handle most damage situations, use IWDM to be effective. The resource, species, location and the type of damage, and the available biologically sound, cost-efficient, legal IWDM methods are analyzed by WS personnel to determine the action(s) necessary to be taken to correct a conflict with a predator.

The proposed action would continue to allow the use of all legal and appropriate methods to resolve predator damage problems when requested. A wide range of methods is available for resource owners and WS personnel; these are described in more detail in Chapter 3. PDM methods fall into different categories including cultural practices (i.e., shed lambing and guard animals), habitat and behavior modification (i.e., exclusion, chemical repellents, and hazing with pyrotechnics), and population management (i.e., traps, shooting, and toxicants). Population management methods used by WS personnel can include shooting, calling and shooting, aerial hunting, leghold traps, cage traps, snares, M-44s, chemical immobilization and euthanasia, denning, gas cartridges, decoy and tracking dogs, and hand-capture depending on location and applicable laws. The population management techniques are primarily used lethally, but some of them (e.g., hand-capture, use of leg-hold traps/snares, cage traps) may also be used non-lethally.

PDM would be allowed in Colorado, under the proposed action, when and where requested on private and nonprivate lands. Before PDM is conducted operationally by WS, an *Agreement for Control* must be signed by WS and the land owner or manager, or a *WS Work Plan (WP)* must be prepared in consultation with the land management agency. PDM as conducted by WS would comply with all applicable Federal, State, Tribal and local laws and current MOUs between WS and the various management agencies. WS personnel communicate with other agency personnel as appropriate and necessary.

The primary objective of PDM for WS in Colorado is to respond to 100% of the requests for assistance through technical assistance or direct operational PDM. In addition, all new cooperators would be given information, as applicable, on nonlethal PDM methods that could be effective to reduce predator damage.

1.3.2 Need for PDM for the Protection of Livestock

Predators are responsible for the depredation of a wide variety of livestock including cattle, sheep, goats, swine, exotic pen-raised game, other hoofed-stock, and poultry. Depredation is defined as the killing, injury, or harassment of livestock resulting in monetary losses to the owner. Cattle and calves are vulnerable to predation, especially at calving (NASS) 1992, 1996, 2001). Sheep, goats, and poultry are highly susceptible to year-round predation (Henne 1975, Nass 1977, 1980, NASS 1991, 1995, 2000, Tigner and Larson 1977, O'Gara et al. 1983). Livestock losses cause economic hardships to their owners, and without effective PDM to protect them, predation losses and, hence, economic impacts, can continue to increase (Nass 1977, 1980, Howard and Shaw 1978, Howard and Booth 1981, O'Gara et al. 1983). Bears and mountain lions (Mysterud 1977, Shaw 1987) are occasionally responsible for catastrophic incidents or large losses of sheep and lambs, sometimes called "surplus killing," when only selected tissues or parts are consumed or the carcasses are not fed on at all. Bears or mountain lions may also frighten an entire flock of sheep as they attack, resulting in a mass stampede; this sometimes results in many animals suffocating as they pile up on top of each other in a confined area, such as along thick willow growth in the bottom of a drainage or in corrals. It is not uncommon to find multiple sheep killed by either of these two species after a killing frenzy; over one hundred sheep have been documented to be killed by a mountain lion in one incident (Wade and Bowns 1982).

Of the predators that kill livestock, coyotes inflict the highest percentage of damage. Coyotes accounted for 93% of all predator-killed lambs and ewes on nine sheep bands in shed lambing operations in southern Idaho and 25% of these kills were not fed upon (Nass 1977). Coyotes were also found to be the predominant predator on sheep during a study in Colorado; it was found during this study that more than 43% of lambs killed by coyotes were not fed upon (DeLòrenzo

and Howard 1977). Coyotes were also the primary predator on sheep throughout a Wyoming study and essentially the only predator in winter (Tigner and Larson 1977).

Other predators that cause predation on cattle, calves, sheep and lambs in Colorado are black bears, mountain lions, and feral dogs. Bears and lions can cause substantial losses. Feral or free ranging dogs are also responsible for considerable predation on livestock and wildlife, and it is not uncommon to find multiple kills from them. Other small carnivores such as badgers, gray fox, red fox, raccoons, and striped skunks will prey on livestock but primarily young lambs, kid goats, and domestic fowl.

- 1.3.2.1 Contribution of Livestock to the Colorado Economy. In 2004, agriculture generated over \$4.3 billion in annual sales from farm and ranch commodities in Colorado (NASS 2004). Of this, livestock production, primarily cattle, sheep, swine, and poultry, accounted for about 71% of total farm commodity cash receipts and is, therefore, considered a primary agricultural industry sector in the State. In 2004, the total cash value from sales of all livestock products was about \$3.3 billion in Colorado (NASS 2004). Cattle, sheep, and swine production contributes substantially to local economies. At the end of 2003 to the beginning of 2004, Colorado livestock inventories included 2,400,000 cattle and calves, 360,000 sheep and lambs, 770,000 swine, and 5,100,000 chickens (NASS 2004). In addition, goats, other poultry, rabbits, ratites (ostriches and emus), and exotic livestock are produced in Colorado, but at lower levels. Sheep inventories in Colorado have declined significantly over the last 15 years from a high of 840,000 in 1990 (NASS 2004). Part of the reason is that the sheep and wool market has declined making it uneconomical to raise sheep. However, the number of AUMs (animal unit months) allotted on BLM and USFS lands has been declining in many areas of the United States and this has had a negative impact on livestock production. In Nevada, a study determined that the reduction in AUMs there had about a 9% negative economic effect annually (Pearce et al. 1999) in the 1990s.
- 1.3.2.2 Scope of Statewide Livestock Losses. NASS conducted comprehensive national surveys of sheep lost to predators in 1994 and 1999 (NASS 1995, 2000) and cattle lost to predators in 1995 and 2000 (NASS 1996, 2001). NASS (1995) reported that predators (coyotes, black bears, feral dogs, mountain lions, bobcats, and foxes) killed 6,200 adult sheep valued at \$483,600 and 18,900 lambs valued at \$737,100 in Colorado during 1994. Sheep and lamb inventory numbers dropped 32% from 647,000 head in 1994 to 440,000 head in 1999 (NASS 2004). NASS (2000) reported predators (coyotes, black bears, feral dogs, mountain lions, bobcats, and foxes) killed 2,800 adult sheep valued at \$277,000 and 8,700 lambs valued at \$583,000 in Colorado in 1999. Of the sheep and lambs killed by predators in 1999 (NASS 2000), coyotes were responsible for about 62%, black bears 14%, dogs 13%, mountain lion 6%, and foxes 2%. Cattle and calf predation losses in Colorado totaled 5,000 head valued at \$1.5 million in 1995 (NASS 1996) and 3.500 head valued at \$1.3 million in 1995 (NASS 1996). The number of cattle and calves in Colorado increased 5% from 3,000,000 in 1995 to 3,150,000 in 2000 (NASS 2004), but predation losses decreased 30%. Of predation losses to cattle in 2000 (NASS 2001), coyotes were responsible for about 80%, mountain lions 9%, and dogs 3%. These losses occurred in spite of PDM efforts by producers, who must bear the additional costs for these activities (Jahnke et al. 1987), and WS personnel. NASS (2000) reported that many Colorado sheep producers used nonlethal tactics to reduce predator damage; producers used fencing (31%), guard dogs (23%), llamas (9%), donkeys (3%), lamb shed (67%), herding (7%), night penning (79%), frightening tactics (6%), and other nonlethal methods (4%). NASS (2001) also reported that Colorado cattle producers used nonlethal tactics to reduce predator damage; producers used fencing (18%), guard animals (25%), herding (7%), night penning (14%), frightening tactics (18%), livestock removal (64%), and other nonlethal methods (5%).

The Colorado NASS Office also has completed surveys of predation to sheep and lambs in Colorado, a more detailed survey than that done nationally by NASS (1995, 2000) and reflected much more damage. Predators killed 28,000 head at an estimated value of 2.08 million dollars in damage to sheep and lambs in 2002 (NASS 2003). Coyotes were responsible for 54% of the mammalian predator losses, followed by black bear (24%), mountain lions (6%), and red fox (6%). Predator losses in Colorado: 34,000 sheep and lambs lost in 1997, 27,000 in 1998, 23,000 in 1999, and 19,500 in 2000. These data (NASS 2003) are higher than the data collected nationally (NASS 2000) (probably something related to higher sampling at the local level), but both indicate the severity of the problem.

WS also collects information on losses on those properties where WS conducts PDM or provides advice. WS personnel respond to reports from resource owners of losses to predators which may or not be verified. Verified losses are defined

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as those losses examined by an WS Specialist during a site visit and identified to have been caused by a specific predator. Confirmation of the species that caused the loss is a vital step toward establishing the need for PDM and the level of assistance necessary to resolve the problem. WS Specialists not only confirm the predators responsible (where evidence exists) for losses, but also record the extent of the damage when possible. Losses that are reported, but not confirmed, are defined as those losses reported by the resource owner to WS and not confirmed during a site visit. Livestock losses reported to WS by cooperators are recorded as confirmed losses only if WS personnel are able to visit the site and make a determination of the causative species. Losses are considered unconfirmed if WS confirmation of the causative species is not made. Other reported losses might involve situations where the identity of the predator species could not be determined by the WS Specialist. In Colorado from FY00 to FY04, WS personnel responded to 950, 772, 689, 398, and 323 requests for assistance where reported and verified losses from predators for all classes of livestock including poultry and commercially raised game averaged almost 3,000 animals worth \$400,000 annually (Table 2). Average livestock losses for FY00 to FY04 included 1,969 sheep and lambs, 185 cows and calves, 68 adult goats and kids, 13 other hoofed stock, 627 poultry including ratites, and rabbits. Of the value for the combined losses from FY00-FY04, coyotes accounted for 55%, mountain lions 22%, black bears 20%, and feral dogs 2%, and a combined total of 1% for red fox, bobcats, raccoons, striped skunks, gray fox, badgers, and long-tailed weasels. Many of the other predators in Colorado covered by this EA are known to kill or injure livestock, but no losses to these predators were recorded in FY00 to FY04.

The loss of livestock in Colorado does not provide an estimate of the effectiveness of PDM provided by WS. The only measure of success of a PDM program is the number of livestock saved from predation. Although it is impossible to accurately determine the amount of livestock PDM saves from predation, it can be estimated. Scientific studies have revealed that in areas without some level of PDM, losses of adult sheep and lambs to predators can be as high as 8.4% and 29.3% of the total number of head (Henne 1975, Munoz 1977, O'Gara et al. 1983). Conversely, other studies have indicated that sheep and lamb losses are significantly lower where PDM is applied (Nass 1977, Tigner and Larson 1977, Howard and Shaw 1978, Howard and Booth 1981). In evaluating cost effectiveness of PDM, USDA (1997) concluded that benefits, in terms of avoided sheep and lamb losses plus price benefits to consumers, are 2.4 times the cost of providing WS PDM services for sheep protection in the 16 western states. That analysis did not address the value of calf protection which is a substantial component of WS PDM services in Colorado.

Most requests for PDM assistance that WS receives are to protect livestock on private lands. Lands with better agricultural value, and hence, more livestock production, were more likely to be bought or claimed by settlers back when the West was settled and thus were more likely to enter into private ownership. As a result, many of the properties claimed were in valleys with easier terrain to manage, more productive soil conditions, and waterways that could be used to grow crops and water livestock. However, under land settlement laws, not all land was claimed, and Congress eventually took control of the remaining lands with much of it becoming National Forests (NF) and National Grasslands (NGs) owned by the USFS and public lands administered by the BLM. Because private lands often have easier terrain for agricultural activities and more productive conditions, they tend to be used for lambing, calving and kidding grounds. This means they are more prone to having predation problems since newborn and young livestock are more vulnerable than adults. Of the livestock losses in FY03 and FY04, 74% of the numbers killed or injured, and 74% of the value of losses, were on private land (Table 3). Of the cattle and sheep losses in FY03 and FY04, 66% of the numbers lost, and 72% of the value of losses, occurred on private lands (Table 3). WS has no authority to determine how these lands, including any associated riparian areas or wetlands, are managed.

Table 2. Livestock lost to predators in Colorado recorded by WS Specialists responding to requests for assistance from FY00 to FY04. The number is the actual number of livestock involved and not incidences of damage.

SPECIES		FY00		FY01		FY02	1	FY03	i	FY04		verage
	#	\$ Value \$	#	\$ Value \$	#	\$ Value \$	#	\$ Value \$	#.	\$ Value/Yr	#	\$ Value/Yr
	<u> </u>					Cattle/Calve	s		1			
Black Bear	15	\$8,250	14	\$7,750	9	\$3,100	19	\$9,225	7	\$3,650	13	\$6,395
Coyote	309	\$250,226	216	\$87,155	107	\$42,800	85	\$32,300	79	\$39,303	159	\$90,357
Feral Dog	7	\$4,425	23	\$13,000	9	\$4,150	3	\$1,500	l	\$500	9	\$4,715
Mtn. Lion	-		9	\$4.000	2	\$700	8	\$2,675	2	\$1,200	4	\$1,715
Subtotal	331	\$262,901	262	\$111,905	127	\$50,750	115	\$45,700	89	\$44,653	185	\$103,182
	L.F.Beirer					Sheep/Lamb	s		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
Black Bear	877	\$101,575	595	\$102,310	410	\$36,675	203	\$22,390	368	\$53,580	491	\$63,306
Bobcats	2	\$160	-	-	11	\$765	-	-	6	\$580	4	\$301
Coyotes	1,809	\$177,417	1,343	\$134,246	1,219	\$74,399	746	\$72,190	1,412	\$117,400	1,306	\$115,130
Feral Dog	41	\$6,720	5	\$420	-	-	6	\$360	10	\$975	12	\$1,695
Red Fox	31	\$2,969	55	\$4,785	20	\$1,290	1	\$100	25	\$2,460	26	\$2,321
Mtn. Lion	300	\$129.939	129	\$12,840	111	\$9,625	28	\$3,915	83	\$9,660	130	\$33,196
Subtotal	3,060	\$418,780	2,127	\$254,601	1,771	\$122,754	984	\$98,955	1,904	\$184,655	1,969	\$215,949
					Goats/k	Kids including	g Mohai	Г				
Black Bear	13	\$1,125	43	\$4,230	38	\$1,600	10	\$1,600	3	\$300	21	\$1,771
Coyote	37	\$3,015	25	\$1,420	35	\$1,255	3	\$80	14	\$2,600	23	\$1,674
Feral Dog	20	\$2,300	4	\$600	-	-		-	2	\$400	5	\$660
Red Fox	6	\$120	9	\$450	5	\$250	-	-	-	-	4	\$164
Mtn. Lion	3	\$305	17	\$1,550	15	\$1,215	22	\$1,430	15	\$990	14	\$1,098
Subtotal	79	\$6,865	98	\$8,250	93	\$4,320	35	\$3,110	34	\$4,290	-68	\$5,367
				Other Hoof	ed Stock	- Swine, Ho	rses, Lla	mas, Exotics				
Black Bear	3	\$135	4	\$5,450	4	\$22,593	-	-	-	-	2	\$5,636
Coyote	3	\$5,000	1	\$15,000	-	-	•	-	3	\$480	1	\$4,096
Feral Dog	2	\$500	1	\$500	1	\$1,600	3	\$100	-	-	1	\$540
Mtn. Lion	18	\$163,000	8	\$80,050	4	\$2,200	4	\$3,900	7	\$5,700	8	\$50,970
Subtotal	26	\$168,635	14	\$101,000	9	\$26,393	7	\$4,000	10	\$6,180	13	\$61,242
. 1	!		<u> </u>		Poultr	y, Ratites, R	abbits			······		<u> </u>
Badger	-	-	-	-	-	-	10	\$100	-	-	2	\$20
Black Bear	19	\$135	19	\$170	1,061	\$10,999	-	-	-	_	220	\$2,261
Bobcats	250	\$3,750	-	-	27	\$490	57	\$640	22	\$90	71	\$994
Coyotes	405	\$5,435	38	\$305	78	\$550	105	\$1,375	310	\$4,740	187	\$2,481
Feral Dog	12	\$75	4	\$600	2	\$100	53	\$1,100	-	-	14	\$375
Gray Fox	_		-	-	24	\$180	-	-	2	\$40	_ 5	\$44
Red Fox	78	\$1,084	77	\$990	40	\$250	33	\$287	93	\$901	64	\$702
Mtn. Lion	24	\$120	1	\$1,200		-	114	\$1,290	-	-	28	\$522
Raccoon	5	\$35	17	\$1,080	41	\$321		-	49	\$512	22	\$390
Str. Skunk		-		-	29	\$230	22	\$62	-	-	10	\$58
L-t Weasel			16	\$86	-		-	- 04074	-	-	3	\$17
Subtotal	793	\$10,634	172	\$4,431	1,302	\$13,120	394	\$4,854	476	\$6,283	627	\$7,864
Total	4,289	\$867,815	2,673	\$480,187	3.302	\$217,337	1,535	\$156,619	2,513	S246,061	2,862	\$393,604

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Table 3. Livestock lost to predators in Colorado on private and non-private lands recorded by WS for FY03 and FY04 where WS conducted operational programs.

	Predator		vate	BI	M	US	FS	Other	Land
		FY03	FY04	FY03	FY04	FY03	FY04	FY03	FY04
Sheep .	Black Bear	36	134	-	1	43	42		-
	Coyote	57	94	47	82 -	- .	-	2	11
	Feral Dog	2	4	-	-	-	-	-	-
	Mtn. Lion	9	14	-	-	-	-	-	-
	Total	104	246	47	83	43	42	2	11
	Value	\$15,515	\$21,700	\$4.820	\$10,400	\$5,390	\$6,430	\$700	\$3,700
Lambs	Black Bear	42	100	-	-	79	91	-	-
	Bobcat	-	6	<u>.</u> .	-	-	-	-	-
	Coyote	428	668	40	53	170	302	-	1
	Feral Dog	4	-	-	-	_	-	-	-
•	Red Fox	1	25	-	-	-	-	-	-
	Mtn. Lion	18	59	-	-	-	10	-	-
	Total	493	858	40	53	249	403	0	l
	Value	\$43,150	\$76,810	\$3,940	\$4.900	\$24,540	\$30,100	\$0	\$300
Cattle/Calves	Black Bear	19	7	_	-	-	_		-
	Coyote	81	69	1	4	-	-	-	-
	Feral Dog	3	-	-	-	-	-	-	-
	Mtn. Lion	8	2	-	-	-	-	-	-
	Total	111	78	1	4	0	0	0	0
	Value	\$45,200	\$41,953	\$400	\$1.600	\$0	\$ 0	\$ 0	\$0
Subtotal Ave.	Total	94	.5	1.1	4	36	9	7	
Sheep/Cattle	Value	\$122	.164	\$13.	030	\$33,	230	\$2,3	350
Other	Black Bear	10	3	-	-	-	-	-	-
Livestock	Bobcat	57	22	-	-	-	-	-	
(Poultry,	Coyote	108	.325	-	-	-	-	-	-
Goats, Horses, Swine,	Feral Dog	49	-	-	-	-	-	-	•
Llamas.	Gray Fox	-	2		-	-	-	-	
Ratites, Exotic	Red Fox	19	93	-	-	-	~	-	-
Game)	Mtn. Lion	134	21	-			-	-	•
·	Raccoon	-	22	-	_	-	-	-	-
	Striped Skunk	22		-	-	-	-	-	-
	Total	399	488	0	0	0	0	0	0
	Value	\$9.547	\$15,803	\$0	\$0	\$0	\$0	\$0	\$0
Total Ave./Yr.	Livestock Lost	1,3	89	11	4	36	9	7	
Гotal Ave,/Yr .	Value of	\$134.	,839	\$13.0)30	\$33,	230	\$2,3	50

Public lands administered by BLM, lands owned by the USFS, and other non-private lands in Colorado are used to graze primarily sheep and fewer cows as is reflected in the losses (Table 3). Non-private lands represent 56% of the lands under agreement by WS in Colorado. However, most losses occur on private lands. USFS lands showed about a fourth of the losses of cattle and sheep in Colorado in FY03 and FY04 to coyotes, black bears, mountain lions and other minor predators. BLM lands showed a tenth of the losses of sheep and cattle to private lands and were mostly identified as lost to coyotes. Total losses of sheep and cattle caused by predators in FY03 and FY04 averaged 369 head valued at \$33,230 on USFS lands, 114 head valued at \$13,030 on BLM lands, and 7 head valued at \$2,350 on other non-private lands. Losses for non-private lands were 26% of the total reported livestock lost in FY03 and FY04. Thus, even though WS

has agreements on a higher percentage of non-private lands, most PDM is focused on private lands to address predator problems at the damage site.

In addition to direct livestock losses to predators such as predation and injury, producers also lose livestock indirectly to predators. A potential indirect loss to cattle producers is disease transmission from predators. For example, cattle can become infected with rabies after being bitten by infected animals such as skunks and fox. Indirect losses are typically minor, but the potential losses can be devastating should a major outbreak occur. WS periodically assists CDC, CDPHE and other State Health programs in monitoring disease prevalence by taking blood samples from captured animals, and Colorado WS has collected many such samples in recent years and has a Disease Wildlife Biologist on staff.

1.3.3 Need for PDM for Protection of Crops, Property, and Human Health and Safety

Predators impact a number of resources in Colorado other than livestock. Typically this damage is less than the damage to livestock, yet it can be very significant to individuals. Other resources that predators can damage include crops, property, and natural resources, and predators can represent a threat to human health and safety.

1.3.3.1 Crops. Field crops such as melons (watermelons and cantaloupes), milo, sweet corn, field corn, and wheat have been damaged by predators such as coyotes, feral/free-roaming dogs, badgers, and raccoons. Fruits, nuts, and their trees have been damaged by bears and raccoons in Colorado. Another type of problem is improved or planted pasture damage caused by badgers and coyotes burrowing; this digging activity often leaves the ground uneven which can hamper the use of planting and mowing equipment and result in damage to the equipment. Damage to crops from predators from FY00 to FY04 (Table 4) included an average of 7 requests for assistance for damage to many of the above resources from black bear, coyotes, and raccoons valued at an average of \$6,030 annually.

1.3.3.2 Other Agriculture. Several other agricultural commodities can be damaged by predators such as beehives, haystacks, aquaculture, livestock feed, eggs, and irrigation systems. Most of this type of damage has been sporadic and involved raccoons, black bears, badgers, striped skunks, and red fox from FY00 to FY04 (Table 4). Damage from these species invoked an average of 5 complaints annually worth an average of \$7,135. The worst damage in FY03 was at 2 aquaculture facilities where the raccoons were responsible for \$18,000 damage. Bears damaged an average of 15 beehives annually in the 6 complaints from FY00 to FY04. Several other species are responsible for this type of damage, but these species were not responsible for damage from FY00 to FY04.

Table 4. Losses to resources other than livestock in Colorado recorded by WS Specialists responding to requests for assistance for FY00 to FY04.

SPECIES		FY00		FY01		FY02		FY03		FY04	A	\verage
	Incid.	\$ Value \$	Incid.	\$ Value S	Incid.	\$ Value \$	Incid.	\$ Value \$	Incid.	\$ Value/Yr	Incid.	\$ Value/Yr
				Crops inclu	iding cor	n, watermelo	n, fruit/n	uts and trees				
Black Bear	-	-	2	\$3,600	3	\$800	2	\$400	3	\$10,100	2	\$2,980
Coyote	1	\$2,000	3	\$3,000	4	\$2,200	7	\$3,000	2	\$2,500	3	\$2,540
Raccoon	3	\$1,300	1	\$100	1	\$250	1	\$250	4	\$650	2	\$510
Subtotal	4	\$3,300	6	\$6,700	8	\$3,250	10	\$3,650	9	\$13,250	7	\$6,030
		Other Agric	culture i	ncluding hive	es, aquac	ulture, worms	s, eggs, p	asture, irrigat	ion syste	ms, and feed		
Badger	1	\$1,000	-	-	ı	S500	-	_	1	\$400	1	\$380
Black Bear	1	\$3,000	1	\$3,000	2	\$4,400	2	\$2,600		-	1	\$2,600
Red Fox	-		-	-	ı	\$0	-		-	-	0	\$0
Raccoon	1	\$400	1	\$150	4	\$1,330	3	\$18,050	2	\$225	2	\$4,031
Str. Skunk	1	\$100	3	\$520		-		-	_		1	\$124
Subtotal	4	\$4,500	5	\$3,670	8	\$6,230	5	\$20,650	3	S625	5	\$7,135
					Pets	s/Zoo Anima	ls (#)					
Coyote	4	\$600	2	\$270	6	\$350	7	\$400	10	\$325	6	\$389

SPECIES		FY00		FY01		FY02		FY03		FY04	A	verage
	lncid.	\$ Value \$	Incid.	\$ Value \$	Incid.	\$ Value \$	Incid.	\$ Value \$	Incid.	\$ Value/Yr	Incid.	\$ Value/Yr
Red Fox		-	5	\$150	-	-	-	-	1	\$3,000	1	\$630
Mtn. Lion	3	\$150	-	<u>.</u>	10	\$260	4	\$3,200	-	-	3	\$722
Raccoon	-	-	~	-	-	-	2	\$150	3	\$85	1	\$47
Str. Skunk	-	-	-	-	7	\$0	-	-	-	-	1	\$0
Subtotal	7	\$750	7	\$420	23	\$610	13	\$3,750	14	\$3,410	13	\$1,788
				Property	y -Turf, l	andscaping, s	tructure	s, aircraft			-	<u> </u>
Badger	_	-	1	\$0	1	\$100	-	-	-	-	0	\$20
Black Bear	2	\$1,480	2	\$1,500	2	\$1,000	2	\$7,000	-	-	2	\$2,196
Coyote	-	-	-	_	2	\$100	-	-	-	-	0	\$20
Red Fox	-	_	1	\$100	1	\$50	-	-	ı	\$0	1	\$30
Raccoon	1	\$100	-	-	4	\$125	4	\$50	5	\$225	3	\$100
Str. Skunk	5	\$500	2	\$200	1	\$ 0	6	\$600	3	\$600	3	\$380
Subtotal	8	\$2,080	5	\$1,800	10	\$1,275	12	\$7,650	9	\$825	9	\$2,726
Total	23	\$10,630	23	\$12,590	49	\$11,365	40	\$35,700	35	\$18,110	34	\$17,679

1.3.3.3 Pets and Zoo Animals. Pets and zoo animals, considered property, are often killed by predators. This is especially common in suburban areas where certain predators adapt well and flourish in the new habitat provided. Coyotes have long been known for their adaptability and living in suburban neighborhoods. They are especially aggressive towards dogs during the breeding season and will attack and kill them, even those being walked on a leash. Deer often feed in these environments attracting mountain lions which are not averse to taking pets. These species become accustomed to human smells and, over time, can lose much of their fear of humans. Other species that killed or injured pets from FY00 to FY04 (Table 4) were red fox, raccoons, and striped skunks.

1.3.3.4 Property. WS also responds to requests from landowners and other agencies to alleviate property damage from predators such as: black bears breaking in and destroying the interiors of homes or other structures; raccoons and skunks burrowing into or under homes to den; skunks and raccoons gaining access into a home through a pet door to eat pet food; and badgers, skunks, or raccoons causing damage to landscaping, gardens, or golf courses from feeding activities. From FY00 to FY04 (Table 4), WS reported predator damage to a variety of property in an average of 13 incidences per year from black bears, striped skunks, raccoons, red fox, coyotes, and badgers which had an average annual worth of \$2,726. Any of the predators in this EA have the potential to be involved in property damage. It is not uncommon for species such as marten and ringtails to gain access into cabins through chimneys and raid them. The protection of property is the most likely reason WS would respond to a complaint invoked by species that are rarely encountered.

1.3.3.5 Human Health and Safety. WS conducts limited PDM actions in Colorado to reduce human health and safety concerns for the public. Human health and safety concerns include: human attacks from mountain lions, bears, and coyotes that result in injuries or death; disease threats from rabies and plague outbreaks where predators act as reservoirs (as discussed under 1.3.2.2 for livestock); odor and noise nuisances from skunks, opossums, and raccoons in attics and under houses; and aircraft strike hazards from coyotes and red fox crossing runways at airports or airbases. Typically the biggest concern of the public, though a rarity, is from the threat of attacks on people by large predators. Mountain lion attacks on humans in the western U.S. and Canada, have increased markedly in the last two decades, primarily due to increased lion populations and human use of lion habitats (Bier 1992). No lion-caused fatalities have been clearly documented in Colorado from FY00 to FY04, but have occurred. Baker and Timm (1998), after several human-coyote interactions in an area, concluded that the use of leghold traps to capture and euthanize a few coyotes would be the best method to resolve the problem and have the most lasting effects. After a child was killed by a coyote in Glendale, California, city and county officials trapped 55 coyotes in an 80-day period from within one-half mile of the home, an unusually high number for such a small area (Howell 1982).

WS assists many residents, especially in urban areas such as the Denver metropolitan area concerned about coyote attacks on their pets and their apparent loss of fear for humans. Predator attacks on humans fortunately occur very rarely, but could result in requests for assistance under the current program. During FY01, WS responded to one incident involving 2 people injured by feral dogs, and in FY00, to black bear and coyote incidents where people were injured from them. WS has responded to complaints involving mountain lions that were perceived as threats to public safety. Recommendations are generally made to consider exclusion methods to reduce human health and safety concerns, but the animals present are often removed. Striped skunks (49%), raccoons (19%), red fox (13%), coyotes (7%), mountain lion (5%), black bears (2%), feral dogs (2%), feral cats (2%), and western spotted skunks, bobcat, and opossum (1%) were responsible for an average of 61 human health and safety requests annually from in FY00 to FY04, including identified threats and nuisance complaints.

1.3.3.6 Natural Resources. Predators are sometimes responsible for requests for assistance involving natural resources such as T&E, sensitive, and game species protection. From FY00 to FY04, WS conducted an average of 1 natural resource protection project annually. The most notable, WS conducted PDM in FY03, primarily for bobcats and coyotes, for the protection of the endangered black-footed ferret reintroduced in western Colorado. WS conducted one PDM project for natural resources in FY00, feral dog management for the protection of mule deer (*Odocoileus hemionus*). WS has also conducted coyote management for the protection of sandhill cranes (*Grus canadensis*) in FY04 and elk (*Cervus elaphus*) in FY01. Finally, raccoons were the focus of another project protecting fish at a hatchery in FY02. WS is responsive to agencies with management responsibilities for wildlife species that are impacted by predation. PDM for wildlife protection can be very effective when predation has been identified as a limiting factor. WS works with these agencies to identify and provide the level of protection needed. When such actions are requested by USFWS or another Federal agency, the responsibility for NEPA compliance rests with that agency. However, WS could agree to meet the responsibility for NEPA compliance at the request of the other Federal agency.

Deer, Bighorn Sheep (Ovis canadensis), and Antelope (Antilocapra americana). Under certain conditions, predators, especially coyotes and mountain lions, can have a significant adverse impact on mule deer, bighorn sheep, and pronghorn antelope populations, and this predation is not necessarily limited to sick or inferior animals (Pimlott 1970, Bartush 1978, USFWS 1978, Trainer 1983, Hamlin et al. 1984, Neff et al. 1985, Shaw 1977). Connolly (1978) reviewed 68 studies of predation on wild ungulate populations and concluded that in 31 cases, predation was a limiting factor.

Mackie et al. (1976) documented high winter loss of mule deer to coyote predation in north-central Montana and stated that coyotes were the cause of most overwinter deer mortalities. Teer et al. (1991) documented that coyote diets contain nearly 90% deer during May and June. They concluded from work done at the Welder Wildlife Refuge; Texas that coyotes take a large portion of the fawns each year during the first few weeks of life. Remains of 4 to 8 week old fawns were also common in coyote scats (feces) in studies from Steele (1969), Cook et al. (1971), Holle (1977), Litvaitis (1978), Litvaitis and Shaw (1980). Mule deer fawn survival was significantly increased and more consistent inside a predator-free enclosure in Arizona (LeCount 1977, Smith and LeCount 1976). Hamlin et al. (1984) observed that a minimum of 90% summer mortality of fawns was a result of coyote predation. Trainer et al. (1981) reported that heavy mortality of mule deer fawns during early summer and late autumn and winter was limiting the ability of the population to maintain or increase itself. Their study concluded that predation, primarily by coyotes, was the major cause for low fawn survival on Steens Mountain in Oregon. Other authors observed that coyotes were responsible for most of fawn mortality during the first few weeks of life (Knowlton 1964, White 1967).

Guthery and Beasom (1977) demonstrated that after coyote damage management, deer fawn production was more than 70% greater after the first year, and 43% greater after the second year in their southern Texas study area. Another Texas study (Beasom 1974a, 1974b) found that predators were responsible for 74% and 61% of the fawn mortality for two consecutive years. Stout (1982) increased deer production on three areas in Oklahoma by 262%, 92% and 167% the first summer following coyote damage management, an average increase of 154% for the three areas. Garner (1976), Garner et al. (1976) and Bartush (1978) found annual losses of deer fawns in Oklahoma to be about 88% with coyotes responsible for 88% to 97% of the mortality. Knowlton and Stoddart (1992) reviewed deer productivity data from the Welder Wildlife Refuge following coyote reduction. Deer densities tripled compared with those outside the enclosure, but without harvest management, ultimately returned to original densities due primarily to malnutrition and parasitism.

Chapter 1

Jones (1949) believed that coyote predation was the main limiting factor of pronghorn antelope in Texas. A six-year radio telemetry study of pronghorn antelope in western Utah showed that 83% of all fawn mortality was attributed to predators (Beale and Smith 1973). In Arizona, Arrington and Edwards (1951) showed that intensive coyote damage management was followed by an increase in pronghorn antelope to the point where antelope were once again huntable, whereas on areas without coyote damage management this increase was not noted. Similar observations of improved pronghorn antelope fawn survival and population increase following damage management have been reported by Riter (1941), Udy (1953) and Smith et al. (1986). Major losses of pronghorn antelope fawns to predators have been reported from additional radio telemetry studies (Beale 1978, Barrett 1978, Bodie 1978, Von Gunten 1978, Hailey 1979, and Tucker and Garner 1980).

Coyote damage management on Anderson Mesa, Arizona increased the herd from 115 animals to 350 in three years, and peaking at 481 animals in 1971 (Neff et al. 1985). After coyote damage management was stopped, the pronghorn fawn survival dropped to only 14 and 7 fawns per 100 does in 1973 and 1979, respectively. Initiation of another coyote damage management program began with the reduction of an estimated 22% of the coyote population in 1981, 28% in 1982, and 29% in 1983. Pronghorn antelope populations on Anderson Mesa, during 1983, showed a population of 1,008 antelope, exceeding 1,000 animals for the first time since 1960. Fawn production increased from a low of 7 fawns per 100 does in 1979 to 69 and 67 fawns per 100 does in 1982 and 1983, respectively. After a five-year study, Neff and Woolsey (1979, 1980) determined that coyote predation on pronghorn antelope fawns was the primary factor causing fawn mortality and low pronghorn densities on Anderson Mesa, Arizona. Smith et al. (1986) noted that controlling coyote predation on pronghorn fawns could result in 100% annual increases in population size, and that coyote removal was a cost-effective strategy in pronghorn antelope management.

Bighorn sheep are susceptible to predation, especially where their populations have reached precariously low numbers (Mooring et al 2004). Mountain lions are the primary predator of bighorns, but coyotes and bobcats will also take them. Mooring et al. (2004) found that in New Mexico, rams had the highest predation rates and thought it was mostly from mountain lions. It has been thought that the rams use habitat conducive to predation by lions, poor post-rut body condition, and are more easily stalked because their curls block more of their rear vision (Harrison and Hebert 1989, Schaefer et al. 2000, Mooring et al. 2004). However, other studies found that lambs (Ross et al. 1997) and females (Krausman et al. 1989) were taken more by mountain lions in proportion to their population; other studies found that predation rates reflected the proportion of sex and age class in the population (Hayes et al. 2000)or a particular lion's predation habits (Ross et al. 1997). Concern has arisen in New Mexico for certain populations of bighorn sheep and they are on the State endangered list; WS may be asked to protect them, especially where their populations reach a level that surpasses the point where the benefits of herd group size has anti-predator strategies (Mooring et al. 2004).

The above cases show that coyote predation had a significant influence on white-tailed deer (*Odocoileus virginianus*), black-tailed deer (*O. hemionus columbianus*), pronghorn antelope and bighorn sheep populations. Ballard et al. (2001) reviewed published predator-deer relationship studies, including many of those above, since the mid 1970s and found that predators (coyote, mountain lion, and wolf) could cause significant mortality, but PDM may or may not result in higher populations and increased harvest levels for hunters. They found that PDM benefitted big game mostly when herds were well below forage carrying capacity, predation was identified to be a limiting factor, PDM efforts sufficiently reduced the predator population, PDM efforts were timed correctly (prior to fawning and denning), and PDM was focused on a small scale (<259 mi²). Conversely, PDM was not effective when the above conditions were not met. In addition, Ballard et al. (2001) suggested that the experimental design of research being conducted on PDM to benefit deer needed to be improved because it was unclear in several studies if PDM had a significant effect protecting deer herds. The most convincing evidence of deer population increases as a result of PDM were from studies conducted in small enclosures (< 15 mi²) because predator populations were much easier to regulate in smaller areas.

Clearly, under some circumstances, PDM can be an important tool in maintaining specific wildlife management objectives. PDM activities to protect big game species in Colorado to reduce excessive predation is a decision that will primarily rest with CDOW, and WS would assist CDOW at their request. WS would strive to provide protection and conduct such actions in areas where suggests that PDM activities would likely be effective and successful (Ballard et al.2001). However, as the management agency, CDOW would determine when and where PDM would be conducted.

Chapter 1

Nesting Upland Gamebirds, Waterfowl, and Shorebirds. WS has not received requests from CDOW or other agencies to provide protection for certain species of nesting upland gamebirds, waterfowl and shorebirds from predators. A number of PDM projects are conducted by WS in other parts of the U.S. to protect nesting birds that are federally listed T&E species. Three species that are federally listed or are candidates for federal listing in Colorado and that can be impacted by predators include—the least tern (endangered), the Gunnison's sage-grouse (candidate) and the lesser prairie chicken(candidate). WS has conducted PDM for Attwater's greater prairie-chickens in Texas (USFWS 1998b) where skunk, coyote and other species predation were identified as a limiting factor in their recovery. Additional support may be given to these species should it be determined by an agency with management authority over such species that predation from predators has limited their viability. PDM projects for nesting birds are typically of short duration and limited to just prior to and during the critical nesting periods when the eggs, chicks, and setting birds are most vulnerable. PDM activities for nesting birds are typically focused on a few species of mammalian predators notorious for robbing nests of eggs and nestlings such as raccoons, skunks, and coyotes.

Sage-grouse (Centrocercus urophasianus) populations have declined throughout Colorado and the western U.S. over the last several decades due to a variety of environmental factors (Connelly and Braun 1997). Sage-grouse populations occupying habitats that are highly fragmented or in poor ecological condition may exhibit relatively low nest success, low juvenile recruitment, and poor adult survival that may be related to increased predation (Gregg 1991). Populations of some of the most important prairie grouse predators have increased dramatically over the last 100 years (see analysis related to coyote and red fox in Chapter 4), and even in areas of good habitat, predator populations can be so abundant that habitat alone may not suffice to allow grouse populations to increase (Bergerud 1988). Schroeder and Baydack (2001) suggested that as habitats become more fragmented and populations of prairie grouse become more threatened, it becomes more important to consider PDM as a potential management tool. Because damaged sagebrush habitats may take 15-30 years to recover, a predator management strategy that effectively increases nest success and juvenile survival may be useful in offsetting some of the negative effects of poor habitat. This approach might also allow a more rapid recovery of grouse populations following habitat recovery. After 3 years of monitoring the movement, survival and reproduction of reintroduced sharp-tailed grouse (Tympanuchus phasianellus) in northeastern Nevada, Coates and Delehanty (2001) recommended that future reintroductions of sharp-tailed grouse be preceded by 2 months of PDM to increase survival of released birds. In a survey of U.S. public attitudes regarding predators and their management to enhance avian recruitment, Messmer et al. (1999) found that given information suggesting predators are among the threats to a declining bird population, the public generally supported using PDM for the protection of bird populations.

Batterson and Morse (1948) documented heavy predation on sage-grouse nests in northeastern Oregon, and, while the greatest limiting factor was common raven (Corvus corax) predation, it was documented that coyotes and badgers also contributed to nest predation. Keister and Willis (1986) suggested that the major factor in determining sage-grouse population levels in their study area in southeastern Oregon was loss of nests and chicks during the first 3 weeks after hatching. Coyotes and ravens were suspected as the primary nest predators. A coyote removal project was implemented on their study area, and sage-grouse productivity increased dramatically from 0.13 chicks/hen to 2.45 chicks/hen in just 3 years. Willis et al. (1993) analyzed data on sage-grouse and predator populations, weather, and habitat from an area of Oregon that had some of the best sage-grouse habitat in the state. The only meaningful relationship they found was a significant negative correlation between coyote abundance and the number of sage-grouse chicks produced per hen. They concluded that fluctuation in predator abundance was probably the single most important factor affecting annual productivity of sage-grouse in their study area. Presnall and Wood (1953) documented an example illustrating the potential of coyotes as predators on sage-grouse. In tracking a coyote approximately 5 miles to its den in northern Colorado, they found evidence along the way that the coyote had killed three adult sage-grouse and destroyed a sagegrouse nest. Examination of the stomach contents from an adult female coyote removed the next day revealed parts of an adult sage-grouse hen plus six whole newly-hatched sage-grouse chicks. The area around the den was littered with sage-grouse bones and feathers. No other prey remains were found around the den, and it appeared that the pups had been raised largely upon sage-grouse.

Burkepile et al. (2001) radio-marked 31 chicks from 13 broods in 1999 and 44 chicks from 15 broods in 2000. Survival estimates for 1999 and 2000 were only 15% and 18%, respectively. Predators were responsible for 90% of the mortality in 1999 and 100% of the mortality in 2000. Red fox were believed to be one of the primary chick predators, but

predation was also confirmed by unidentified avian and other mammalian predators as well. Bunnell and Flinders (1999) also documented significant predation by red fox on sage-grouse in their study area in Utah, and recently revised sage-grouse management guidelines (Connelly et al. 2000) suggest that red fox populations should be discouraged in sage-grouse habitats. To the extent that red fox, coyotes, and other predators which prey on chicks are also preying on eggs, reducing the populations of these predators from sage-grouse nesting and early brood-rearing areas has the potential to benefit both nesting success and chick survival.

Dumke and Pils (1973) reported that ring-necked pheasant (*Phasianus colchicus*) hens were especially prone to predation during their nest incubation period. Trautman et al. (1974) examined the effects of predator removal on pheasant populations in South Dakota by monitoring pheasant populations in similar 100 mi² areas with and without PDM. They examined two variations of predator removal, one targeting only red fox for 5 years, and the other targeting badger, raccoon, striped skunks and red fox for 5 years. They found pheasant densities were 19% and 132% higher in predator removal areas than in non-removal areas during fox removal and multiple predator species removal, respectively. Chesness et al. (1968) examined the effects of predator removal on pheasant populations in paired treatment and non-treatment areas in Minnesota over 3 years by targeting primarily nest predators, including skunks, raccoons, and crows. They reported a 36% hatching success in predator removal areas versus a 16% hatching success in non-removal areas, as well as higher clutch sizes and chick production in predator removal areas. Nohrenberg (1999) investigated the effects of limited predator removal on pheasant populations on his study areas in southern Idaho and found consistently higher pheasant survival and productivity in predator removal areas as compared to similar non-removal areas.

Thomas (1989) and Speake (1985) reported that predators were responsible for more than 40% of nest failures of wild turkeys (*Meleagris gallopavo*) in New Hampshire and Alabama, respectively. Everett et al. (1980) reported that predators destroyed 7 of 8 nests on his study area in northern Alabama. Lewis (1973) and Speake et al. (1985) reported that predation was also the leading cause of mortality in turkey poults, and Kurzejeski et al. (1987) reported in a radio-telemetry study that predation was the leading cause of mortality in hens. Wakeling (1991) reported that the leading natural cause of mortality among older turkeys was coyote predation, with the highest mortality rate for adult females occurring in winter. Other researchers report that hen predation is also high in spring when hens are nesting and caring for poults (Speake et al. 1985, Kurzejeski et al. 1987, Wakeling 1991). Williams et al. (1980) reported a 59% hatching success for turkeys prior to a predator poisoning campaign, versus a 72% hatching success following a predator poisoning campaign.

In a study of waterfowl nesting success in Canada, researchers found that eggs in most nests were lost to predators such as red foxes, coyotes, striped skunks, raccoons, Franklin's ground squirrels (*Spermophilus. franklinii*), badgers, black-billed magpies (*Pica pica*) and American crows (*Corvus brachyrhynchos*) (Johnson et al. 1988). Cowardin et al. (1985) determined that predation was by far the most important cause of nest failure in mallards (*Anas platyrhynchos*) on their study area. Various studies have shown the skunk and raccoon to be a major waterfowl nest predator resulting in poor nesting success (Keith 1961, Urban 1970, Bandy 1965). On the Sterling Wildlife Management area in southern Idaho, striped skunks, red fox and black-billed magpies were documented as common predators of nesting ducks, with magpie predation identified as the most significant factor limiting waterfowl production (Gazda and Connelly 1993).

In documenting the effects of red fox predation on waterfowl in North Dakota (Sargeant et al. 1984), the researchers concluded that reducing high levels of predation was necessary to increase waterfowl production. Balser et al. (1968) determined that PDM resulted in 60% greater production in waterfowl in areas with damage management as compared to areas without damage management. He also recommended that when conducting PDM, the entire complex of potential predators should be targeted or compensatory predation may occur by a species not under control, a phenomena also observed by Greenwood (1986). Rohwer et al. (1997) documented a 52% nesting success for upland nesting ducks in an area receiving PDM, versus only a 6% nesting success in a similar non-treatment area. Garrettson and Rohwer (2001) likewise documented dramatically higher duck nesting success in areas where predators were removed during the nesting season as compared to areas where no predators were removed, and noted that the annual nature of predator removal allowed for greater management flexibility than most habitat management efforts.

Production of sandhill cranes at Malheur National Wildlife Refuge in southeastern Oregon was severely limited by

predation from coyotes, ravens, raccoons, and mink. PDM for these species on the refuge resulted in increased colt survival (from 1 crane colt surviving to 60) as well as increased production of other waterfowl (USFWS 1989, 1990, 1991, 1994). Several other predators can damage nesting waterfowl, primarily their eggs, such as skunks and foxes. Typically the goal of PDM is to suppress these populations during the nesting season to increase their production.

Other Species. WS may be requested to help protect other species. If a management agency finds that a particular species has been impacted by predation, WS could assist in determining if PDM efforts could help protect the species and implement necessary, if any, PDM actions to correct it. Species being given protection often are T&E species. A T&E species that was reintroduced in Colorado that was given protection from predators, especially prior to their reintroduction, was the black-footed ferret. In the first reintroduction effort by USFWS, 34 of 39 reintroduced ferrets were killed by predators. As a result of the impact of predation, PDM is now conducted at any site where ferrets are going to be reintroduced. Several other Federal and State listed T&E species in Colorado are impacted by predators and include lynx and kit fox.

1.4 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

- WS Programmatic Final Environmental Impact Statement (EIS). USDA completed an Final EIS (hereinafter referred to as USDA 1997) on the national APHIS-WS program. This EA is consistent with the Record of Decision signed for USDA (1997). Pertinent information available in the Final EIS has been incorporated by reference into this EA.
- Colorado WS EAs. WS completed 2 EAs for Eastern (WS 1999a) and Western (WS 1997b) Colorado and
 the Western Colorado was supplemented (WS 2001). This EA will replace the 2 EAs and include much of the
 information contained in them to provide a statewide look at PDM. This EA also includes information for
 additional predators, but does not include predatory birds.
- National Level Memoranda of Understanding. MOUs have been signed between WS and BLM and between WS and USFS which recognize WS's authority and responsibility for WDM, and related compliance with NEPA, on BLM and USFS lands. WS is recognized through the MOUs with BLM and USFS as being the lead agency concerning most WDM on public lands; USFS and BLM are responsible for NEPA compliance when WDM is to protect federal resources such as gopher control to planted seedlings. In the current MOUs that WS has with USFS and BLM, it is recognized that the State has management authority over resident wildlife. CDOW and CDA are the State entities that have been given the primary management authority for resident wildlife (authorities discussed Section 1.6.1) and establishes the management objectives for these species and their damage. WS defers to State laws in the management of predators on these federal lands.
- USFS Land and Land and Resource Management Plans (LRMPs). The National Forest Management Act requires that each NF and NG prepare a Land and Resource Management Plan (LRMP) for guiding long-range management and direction. Colorado has all or part of 11 NFs and 2 NGs; these are managed under the direction of 7 Forest Supervisors and are divided into 34 Ranger Districts in Colorado. WS conducted PDM on 5 NFs and 1 NG (11 Ranger Districts) from FY02 to FY04. WS provides USFS District Rangers, the Forest Supervisors, or both with Work Plans annually on those Ranger Districts where WS expects to conduct PDM. USFS discusses the compatibility of the proposed PDM activities with the LRMP. WS conducts the PDM activities according to all applicable laws and regulations. WS typically conducts PDM on 10 NFs and 2 NGs. If requested, WS could potentially conduct PDM on all NFs/NGs in the State where appropriate (i.e., to protect livestock on grazing allotments, wildlife, or human safety). If WS is requested to conduct PDM on USFS lands not covered by the scope of this EA, then a determination of the need for additional NEPA compliance would be made at that time.
- BLM Resource Management Plans (RMPs). BLM currently uses RMPs to guide land management for public lands it administers and has completed EISs to cover their implementation (see BLM in Literature Cited for a

list of them). Colorado has 11 BLM Resource Areas (RAS) covering about 10 million acres of land and a State Office in Denver. WS conducted PDM on 7 of the 11 BLM RAS from FY02 to FY04. WS provides the appropriate BLM Field Offices with Work Plans annually where WS expects to conduct PDM. BLM discusses the compatibility of the proposed PDM activities with the RMP. WS conducts the PDM activities according to all applicable laws and regulations. If requested, WS could potentially conduct PDM on any BLM RA in the State where appropriate (i.e., to protect livestock on allotments, wildlife, or human safety). If WS is requested to conduct PDM on BLM lands not covered by the scope of this EA, then a determination of the need for additional NEPA compliance would be made at that time.

CDOW Management Plans. CDOW has management plans for mountain lions and black bear, and outlines CDOW's objectives for these species populations in Data Analysis Units (DAUs) and for Colorado as a whole. These clarify the management objectives for these species in Colorado. Colorado WS take of these species are included in the total mortality in the DAUs and the State. WS mostly responds to requests concerning agricultural related damage for these species and some human health and safety threats. WS relies on CDOW to determine what the management objectives are in each DAU and ensure that management objectives are met. WS does not have an idea in which DAU damage will occur from either of these species and where WS would respond to resolve these problems. However, CDOW includes estimates of non-hunter and hunter mortality in making recommendations for the upcoming hunting seasons which includes WS take.

1.5 DECISIONS TO BE MADE

WS is the lead agency for this EA, and therefore responsible for the scope, content, and decisions made. Cooperating agencies in the production of this EA are CDA, CDOW, BLM, USFS, and USFWS. Each of the cooperating agencies were asked to provide input and direction to WS to insure that Program actions are in accordance with applicable regulations and policies, and with the desires of the State of Colorado.

Based on the scope of this EA, the following decisions need to be made.

- Should PDM, as currently implemented, be continued in Colorado under one EA?
- If not, how should WS fulfill its legislative responsibilities in Colorado?
- What standard operating procedures (SOPs) should be implemented to lessen identified potential impacts?
- Does the proposed action have significant impacts requiring preparation of an EIS?

1.6 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.6.1 Actions Analyzed

This EA evaluates PDM to protect livestock, crops, property, natural resources and human health and safety in Colorado at the statewide level.

1.6.2 American Indian Lands and Tribes

WS only conducts PDM at a Tribe's request. WS has been requested to provide assistance with PDM in Colorado on Tribal lands. Since Tribal lands are sovereign and the methods employed are the same as for any private land upon which WS provides services, Tribal officials determine if PDM is desired and the PDM methods allowed. Because the Tribal officials have the ultimate decision on whether PDM is conducted, no conflict with traditional cultural properties or beliefs is anticipated. Therefore, this EA would cover PDM on Tribal lands, where requested and implemented.

1.6.3 Federal Lands

Colorado has a fairly large proportion of federal lands and WS is often requested to conduct PDM on them. The methods employed and potential impacts would be the same on these lands as they would be on private lands upon which WS provides service. Therefore, if WS were requested to conduct PDM on federal lands for the protection of livestock, property, human health and safety, or natural resources such as T&E species, provided impacts of PDM activities for their protection is considered, this EA would cover such actions implemented. NEPA compliance for PDM conducted to protect natural resources such as T&E species at the request of USFWS or other federal agency is the requesting agency's responsibility. However, WS could accept the NEPA responsibility at the request of another agency, but that agency would still be responsible for issuing a NEPA Decision.

1.6.4 Period for Which This EA Is Valid

This EA will remain valid until WS determines that new demands for action or new alternatives for PDM have arisen that have different environmental effects and must be analyzed. At that time, this analysis and document will be supplemented pursuant to NEPA. This EA will be reviewed annually to ensure that it is complete and still appropriate for the scope of PDM activities in Colorado.

1.6.5 Site Specificity

This EA analyzes potential impacts of PDM on the human environment as required by NEPA and addresses WS PDM activities on all lands under Cooperative Agreement or Agreements for Control, or as otherwise covered by WS Work

Plans (e.g., on federal public lands) within Colorado. It also addresses the impacts of PDM on areas where additional agreements with WS may be written in the reasonably foreseeable future in Colorado. Because the proposed action is to continue the current program under one EA, and because the current program's goal and responsibility is to provide service when requested within the constraints of available funding and manpower, it is conceivable that additional PDM efforts could occur. Thus, this EA anticipates potential expansion and analyzes the impacts of such expanded efforts as part of the current program.

Planning for the management of predator damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, etc. Although some of the sites where predator damage is likely to occur and lead to requests to WS for assistance can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible; however, many issues apply wherever predator damage and resulting management occurs, and are treated as such.

The standard WS Decision Model (Figure 3) and WS Directive 2.105 is the site-specific routine thought process for determining methods and strategies to use or recommend for individual actions conducted by WS in Colorado (see USDA 1997, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application). The Decision Model is not intended to require documentation or a written record each time it is used, and it necessarily oversimplifies complex thought processes. Decisions made using the model would be in accordance with SOPs described herein and adopted or established as part of the decision.

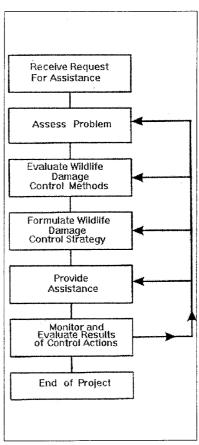


Figure 3. WS Decision Model used at the field level (Slate et al. 1992).

The analysis in this EA considers impacts on target and nontarget wildlife species, people, pets, and the environment. Wildlife populations, with the exception of T&E species, are monitored over large geographic areas (i.e., the West, the State) and smaller geographic areas (i.e., game management units, CDOW "Data Analysis Units"). WS monitors target predator and nontarget take for the State and in each of the WS Districts. The game management units and Districts do not correspond to each other in Colorado, thus, analysis of wildlife population impacts is better analyzed at the statewide level. Additionally, harvest by sportsmen in Colorado is estimated by CDOW from phone surveys. Statistically, the variance at the local level (i.e., the game management unit or County) is very high and can be \pm 100% making the data not as useful. However, the variance is much lower at the statewide level and, thus, harvest data at the statewide level is much more reliable.

1.6.6 Interdisciplinary Development of the EA

Comments were solicited from the BLM, USFS, CDA, CDOW, CDPHE, and USFWS to facilitate an interdisciplinary approach to analysis. Comments are maintained in an administrative file located at the WS State Office, 12345 West Alameda Parkway, Suite 204, Lakewood, CO 80228.

1.7 AUTHORITY AND COMPLIANCE

1.7.1 Authority of Federal and State Agencies for WDM in Colorado⁵

WS Legislative Authority. USDA is authorized and directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for USDA is the *Act of March 2, 1931* and the *Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988 (7 USC 426-426c; 46 Stat. 1468)*, as amended in the Fiscal Year 2001 Agriculture Appropriations Bill, which provides that:

"The Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before the date of the enactment of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2001."

Since 1931, with the changes in societal values, APHIS, WS policies and programs place greater emphasis on the part of the Act discussing "bringing [damage] under control," rather than "eradication" and "suppression" of wildlife populations. In 1988, Congress strengthened the legislative authority of APHIS, WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

"That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities."

WS conducts WDM in cooperation with and under the authorities of CDA and CDOW. The Colorado WS Program works cooperatively with local livestock associations and county governments to provide PDM assistance for its constituents. PDM assistance is provided statewide in areas where funding has been provided. PDM activities occur on both private and public lands, but leghold traps, snares, and toxicants are not currently used on public lands as addressed in Section 1.6.3. WDM methods that can be used in different wildlife damage situations are discussed in detail in Section 3.2.1.2.

⁵ See Chapter 1 of USDA 1997 for a complete discussion of federal laws pertaining to WS.

Colorado Department of Agriculture. Colorado Revised Statutes (CRS) Title 2, Article 12 (1995) discusses CDA's responsibilities regarding depredating animal control. CRS Title 35 states the Commissioner of Agriculture has exclusive jurisdiction over the control of depredating animals (coyotes, wolves, foxes, bobcats, raccoons, mountain lions, bears, striped skunks, and opossums). CRS Title 35 also authorizes CDA to enter into agreements with WS for the purpose of cooperating in the management of damage caused by coyotes, wolves, mountain lions, bobcats, and other depredating animals where they are damaging agricultural resources. It also allows CDA to enter into agreements with other entities to conduct PDM. CDA currently has an MOU with WS. This document establishes a cooperative relationship between WS and CDA, outlines responsibilities, and sets forth objectives and goals of each agency for resolving wildlife damage in Colorado. CDA also regulates pesticide uses in Colorado.

Colorado Division of Wildlife. CDOW has the responsibility to manage all protected and classified wildlife in Colorado, except Federally listed T&E species, regardless of the land class on which the animals are found (CRS Title 33). CDOW is authorized to cooperate with WS for controlling nuisance and non-agriculture property damage caused by big game and furbearers. Landowners, lessees or any other person may obtain a permit to take any wildlife species causing excessive damage to property in Colorado (CRS 33-3-106) and predators can be taken year-round on lands owned or leased by private individuals when causing damage (CRS 33-6-107 {9}). WS is considered an agent of the landowner for the purpose of this section. WS has an MOU with CDOW that details the responsibilities of each agency and the cooperative relationship.

Colorado State Land Board. The Colorado State Land Board is responsible for maximizing economic returns from State Trust Lands in Colorado for the benefit of Trust beneficiaries. Livestock grazing leases are one source of economic return realized from State Trust Lands. As such, the Board has a vested interest in maintaining the economic viability of ranching operations that pay grazing leases on State Trust Lands. Wildlife provides a limited economic benefit to the trust because CDOW purchases the right for licensed sport hunters to pursue such activities on a portion of the State Trust land in the analysis area. In general, however, State Trust Lands are not considered public lands and are not open for public use. PDM has been cited by many livestock producers to be a critical element in maintaining their economic viability and is, therefore, an area that is also of concern to the Board. State land grazing lessees are responsible for requesting and authorizing WS PDM actions on State Trust lands. The Board is a signatory party to a state level MOU between WS and other state and federal agencies.

Colorado Department of Public Health and Environment. Under Amendment 14, the Colorado Department of Public Health and Environment can issue a permit to use prohibited methods for the protection of human health and safety, including issues involving predators. Most public health crises involve the outbreak of a disease.

U.S. Fish and Wildlife Service. USFWS has statutory authority to manage Federally listed T&E species through the Endangered Species Act of 1973 (ESA) (16 USC 1531-1543, 87 Stat. 884) and migratory birds under the Migratory Bird Treaty Act of 1918 (16 USC 703-711; 40 Stat. 755), as amended. They are also responsible for managing refuges and conflicts with predators if they conflict with the refuge management goals.

U.S. Forest Service and Bureau of Land Management. USFS and BLM have the responsibility to manage the resources on federal and Public lands for multiple uses including livestock grazing, timber production, recreation and wildlife habitat, while recognizing the State's authority to manage wildlife populations, and these uses are outlined in LRMPs and RMPs. WS conducts PDM activities on USFS and BLM lands in accordance with all applicable laws and regulations. These agencies recognize WS's expertise in PDM and rely on WS to determine the appropriate methodologies for conducting PDM to reduce losses of livestock and other resources, sometimes on adjacent properties. USFS and BLM can conduct some WDM activities, themselves, to protect resources on their lands, but would be responsible for the NEPA associated with it.

1.7.2 Compliance with Federal Laws and Executive Orders

Several federal laws authorize, regulate, or otherwise affect WS PDM activities. WS complies with these laws, and

consults and cooperates with other agencies as appropriate.

National Environmental Policy Act. Most Federal actions are subject to NEPA (Public Law 91-190, 42 U.S.C. 4321 et seq.) and its implementing regulations established by the Council on Environmental Quality (CEQ) (40 CFR 1500-1508). In addition, WS follows USDA (7 CFR 1b) and APHIS (7 CFR 372) NEPA implementing regulations as a part of the decision-making process.

Migratory Bird Treaty Act of 1918 (16 USC 703-711; 40 Stat. 755), as amended. The Migratory Bird Treaty Act provides the USFWS regulatory authority to protect native species of birds that migrate outside the United States. The law prohibits any "take" of these species, except as permitted by the FWS. The WS program receives authorization from the FWS to take migratory birds that are causing damage problems

Endangered Species Act. The ESA states that all Federal agencies shall seek to conserve T&E species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts consultations with the USFWS, as required by Section 7 of the ESA, to use the expertise of the USFWS, to ensure that "any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species. . . " (Sec.7(a)(2)). WS has obtained a Biological Opinion (BO) from USFWS describing potential effects on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997, Appendix F). WS has completed a formal consultation with USFWS for the proposed PDM program specifically for the lynx (Lynx canadensis) in Colorado (WS 2005) and received a BO (USFWS 2005). That BO dated August 23, 2005, authorizes incidental take in the event that WS actions ever inadvertently result in capture or killing of a lynx in the State, and further prescribes reasonable and prudent measures with terms and conditions by which WS abides to minimize the risk of take.

Fish and Wildlife Act of 1956 (section 742j-1) - the Airborne Hunting Act. The USFWS regulates the Airborne Hunting Act but has given implementation to the States. CDA and CDOW are responsible for issuing permits for aerial hunting in Colorado.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. All pesticides used or recommended by WS are registered with and regulated by the Environmental Protection Agency (EPA) and CDA. WS uses the chemicals according to labeling procedures and requirements as regulated by EPA and CDA.

National Historical Preservation Act of 1966, as amended (NHPA). The NHPA and its implementing regulations (CFR 36, 800) require federal agencies to initiate the section 106 process if an agency determines that the agency's actions are undertakings as defined in Sec. 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under section 106. Each of the WDM methods described in Section 3.2.1.2 that might be used operationally by WS do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Noise-making methods such as propane exploders, pyrotechnics, or firearms that are used at or in close proximity to historic or cultural sites for the purposes of hazing or removing nuisance predators have the potential for audible effects on the use and enjoyment of a historic property. However, such methods would only be used at a historic site at the

request of the owner or manager of the site to resolve a damage or nuisance problem, which means such use would be to benefit the historic property. A built-in mitigating factor for this issue is that virtually all of the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary in those types of situations.

Native American Graves Protection and Repatriation Act. The Native American Graves Protection and Repatriation Act requires Federal agencies to notify the Secretary of the Department that manages the Federal lands upon the discovery of Native American cultural items on Federal or Tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

The Wilderness Act (Public Law 88-577(USC 1131-1136)). The Wilderness Act established a national preservation system to protect areas "where the earth and its community of life are untrammeled by man" for the United States. Wilderness Areas (WAs) are devoted to the public for recreational, scenic, scientific, educational, conservation, and historical use. This includes the grazing of livestock, and activities necessary to support grazing (e.g., PDM), where it was established prior to the enactment of the law (Sept. 3, 1964). The Act also preserved the jurisdiction and responsibility of the States to manage fish and wildlife in federal wilderness areas. Some portions of WAs in Colorado have historic grazing allotments and WS occasionally conducts limited PDM in certain WAs in Colorado for the protection of livestock and other resources and follows all applicable laws and regulations in doing so.

Environmental Justice and Executive Order 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Environmental Justice has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Executive Order 12898 requires Federal agencies to make Environmental Justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. A critical goal of Executive Order 12898 is to improve the scientific basis for decision-making by conducting assessments that identify and prioritize environmental health risks and procedures for risk reduction. Environmental Justice is a priority within USDA, APHIS, and WS. APHIS plans to implement Executive Order 12898 principally through its compliance with the provisions of NEPA.

WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to ensure Environmental Justice. WS personnel use WDM methods as selectively and environmentally conscientiously as possible. All chemicals used by WS are regulated by the EPA through FIFRA, CDA, by MOUs with Federal land managing agencies, and by WS Directives. Based on a thorough Risk Assessment, USDA (1997, Appendix P) concluded that when WS program chemicals are used following label directions, they are highly selective for the target species or populations, and such use has negligible impacts on the environment. The WS operational program properly disposes of any excess solid or hazardous waste. WS assistance is provided on a request basis in cooperation with State and local governments and without discrimination against people who are of low income or in minority populations. The nature of WS's PDM activities is such that they do not have much, if any, potential to result in disproportionate environmental effects on minority or low-income populations. Therefore, no such adverse or disproportionate environmental impacts to such persons or populations are expected.

Executive Order 13045 - Protection of Children from Environmental Health and Safety Risks. Children may suffer disproportionately from environmental health and safety risks, including their developmental physical and mental status, for many reasons. Because WS makes it a high priority to identify and assess environmental health and safety risks, WS has considered the impacts that alternatives analyzed in this EA might have on children. All WS predator damage management is conducted using only legally available and approved damage management methods where it is highly unlikely that children would be adversely affected at all, let alone in any disproportionate way. Based on the Risk Assessment (USDA 1997, Appendix P) concluded that when WS program chemicals and non-chemical methods are used following label directions and normally accepted safety practices and WS standard operating procedures, such use has

negligible impacts on the environment or on human health and safety, which includes the health and safety of children.

1.7.3 Compliance with State Laws

CDOW manages big game (mountain lions and black bear) and furbearers, CDA manages damage to agricultural and rangeland resources from predators, and counties and local agencies manage feral domestic animals, and CDPHE manages some threats to human health and safety. These agencies, are bound by several State laws that regulate PDM. WS complies with these State laws as appropriate, and consults and cooperates with State and local agencies. These laws are in the CRS or Administrative Codes.

Amendment 14, which was an Initiative Measure amending Article XVIII of the Colorado State Constitution, prohibits or restricts the use of leghold traps, snares, and poisons to take wildlife in the State of Colorado. Exceptions include (1) use by municipal departments of health for the purpose of protecting human health or safety; (2) use of nonlethal traps and snares for research, falconry, relocation, or for medical treatment; and (3) use on private property used for agricultural production by private landowners, lessees, or their employees for no more than a 30-day period per year and so long as the owner can present on site evidence that ongoing damage to livestock or crops has not been alleviated by the use of nonlethal PDM methods which have been prohibited. The prohibited methods that can be used for a consecutive 30 day period in a calendar year include leghold traps, quick-kill traps, snares, M-44s, and gas cartridges. Amendment 14 did not limit the use of shooting or live traps; used as lethal methods, which can be used by private persons to control damage on private or public lands. Unless Amendment 14 is revoked or modified, or the State otherwise provides an interpretation that it is inapplicable to federal programs and actions, WS will continue to abide by Amendment 14 in accordance with WS's policy of abiding by State and local laws.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

Chapter 2 contains a discussion of the issues and affected environment, including issues that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), issues that were used to develop SOPs, and issues that will not be considered in detail, with brief discussion of those issues. Also included is a list of issues identified and addressed in previous Colorado WS PDM EAs and Decisions (WS 1997b, 1999a, 2001), but for which explanations are not repeated in detail in this document because the analysis and discussion of those issues in those EAs remains virtually the same. Pertinent portions of the affected environment are described in this chapter below in the discussion of the issues. Descriptions of additional portions of the affected environment will be incorporated into the discussion of the environmental impacts in Chapter 4 and the description of the current program (the "no action" alternative) in Chapter 3.

2.1 THE AFFECTED HUMAN ENVIRONMENT

NEPA requires federal agencies to determine if federal actions affect the quality of the "human environment." As defined by NEPA implementing regulations, the "human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment." (40 CFR 1508.14). Therefore, when a federal action agency analyzes its potential impacts on the "human environment," it is reasonable for that agency to compare the effects of the federal action against the human-caused effects that would occur or can be expected to occur in the absence of the federal action. This concept is applicable to situations involving federal assistance in managing damage associated with State-resident wildlife species or unprotected wildlife species. This section discusses the human environment that could or could not potentially be affected by WS PDM.

2.1.1 Aspects of the Human Environment Relevant to WS PDM Actions

In Colorado, WS PDM activities are conducted on a variety of land classes, primarily private, BLM, and USFS (Section 1.1.2). WS PDM is carried out in several kinds of habitats throughout the State including forests, rangeland, riparian areas, as well as suburban and urban areas,. All of these habitats and lands have been impacted, and continue to be impacted, by humans in a variety of ways independent of actions or involvement by WS.

The natural and physical environment includes a multitude of native, as well as certain introduced and invasive, animal and plant species and the air, water, soils, terrain and human developments that make up their habitats. WS PDM in Colorado targets several of the animal species (Section 2.2.1) and can take others incidentally (Section 2.2.2). Impacts on these species are analyzed in the EA under 5 alternatives (Sections 4.1.1 and 4.1.2). Additionally, WS PDM can be conducted to protect natural resources, primarily other species of wildlife, where predation has been identified as a limiting factor and when requested by other agencies or entities with management authority over the species involved (Section 1.3.3.6). The PDM methods (Section 3.2.1.2) used that have the potential to affect the natural and physical environments include removing wildlife, physical exclusionary methods, and habitat alterations. The PDM methods that WS uses are legal and allowed under applicable laws and regulations. The primary methods used by WS include wildlife removal techniques. WS could operationally use physical exclusion methods (e.g., assistance in installing predator-proof fencing) and habitat alterations (e.g., brush removal near runways on an airport). Colorado State laws allow property owners to conduct these activities in the absence of federal assistance. Thus, these activities could be done by private individuals and other non-federal entities with or without assistance from WS.

Human relationships with the natural and physical environment have resulted in the establishment and management of virtually all of the resources protected by WS PDM such as agricultural resources and property. For example, livestock raised or maintained on private and public lands in the State have been placed there, and are managed by, humans. Thus, the livestock and their human owners/managers are a long established part of the human environment. They are also a primary group requesting WS PDM assistance in counties where WS has programs. Urban and suburban residential and commercial developments established and maintained by humans are also established components of the human environment. People living, working, and recreating in urban and suburban areas as well as in rural areas where wildlife and their habitats exist are also established components of the human environment. Threats to the health and safety of

people as a result of interactions with predators can and do result in PDM actions by WS. These actions could also be conducted by private or local/state government entities to reduce such threats, and those types of actions by such non-federal entities are also established components of the human environment.

It is common knowledge that humans have altered and continue to alter the natural and physical environment. WS PDM activities do not affect habitat to any substantial degree. On occasion, program personnel might perform minor habitat alterations in specific isolated situations to reduce the attractiveness of a site to problem-causing wildlife (e.g. removal of brush that serves as hiding cover for coyotes near an airport runway, or direct assistance with the installation of a barrier fence to exclude predators from lambing grounds). However, most such alterations are not done by WS, but by the resource owner or manager, which means they are included among the human relationships that exist with the natural and physical environment. Larger actions that alter one habitat into another, such as housing developments, generally result in major shifts in wildlife species composition, diversity, and population levels. Several of the species that cause needs for PDM in Colorado, for example raccoons and coyotes, often thrive in these heavily human-altered environments. For example, raccoon densities can increase substantially in urban settings as a result of increased availability of food, water, and cover. As a result, an increase in PDM may be needed in such areas to prevent damage to houses, landscaping, pets, or to reduce threats to human health and safety. All of these human-caused changes to the natural and physical environment are established components of the human environment.

The human environment also includes less concrete relationships between people and the environment, including the animal species found there. On the one hand, many people experience aesthetic appreciation or enjoyment of the outdoors (Section 2.2.4) or of wildlife viewing (Section 2.3.2). On the other hand, some people can be fearful of or attacked by large predators and may deem their experience with such wildlife as negative. Livestock and other resource owners may not have a favorable opinion of some predators because of the damage such predators have caused or may cause. The relationship also includes the use of PDM methods and their potential risks to the public (Section 2.2.3). Most PDM methods used by WS can also be used by the public as allowed under State and local laws. Inherent dangers of use may increase for the public depending on who is conducting PDM and which methods are being used (analyzed in Section 4.1.4). All of these types of human relationships are established components of the human environment.

2.1.2 The Environmental Baseline

To determine impacts of federal actions on the human environment, an environmental baseline needs to be established with respect to the issues considered in detail so that the impacts of the alternatives can be compared against the baseline. Based on the existing human environment described above, and the numerous types of human relationships that are established components of that environment, it is quite apparent that the baseline appropriate to use for analysis in this EA is not a "pristine" or "non-human-influenced" environment, but one that is already heavily influenced by human actions and direct management.

PDM has been conducted in Colorado for decades and, thus, the environmental baseline could be considered as including the effects of the current ongoing WS program. Information necessary to determine the baseline for issues relevant to this EA include data on species take in PDM, wildlife population numbers and general trends, effects of PDM on recreation, and relative safety of PDM methods in use. For wildlife populations, definitive numbers are not often available but can be estimated from the best natural history information available regarding densities and occupied range or habitat types. Current and past harvest information (especially for those species which have current hunting/trapping seasons) can be used to compare impacts because wildlife populations are a renewable resource and a certain percentage can be taken from the population without adverse impacts. The analysis in Section 4.1 uses the best available information to determine the relative impacts of the proposed action and alternatives on the current "environmental status quo" (the human environment as it is today that includes ongoing WS PDM actions). The Current Program Alternative (i.e., a continuation of the status quo) can thus be viewed as an appropriate baseline for analysis in this EA.

The wildlife population baselines are those that are in place under the current condition of the human environment which means they incorporate and reflect the populations as they have been and are being affected by humans. Effects by humans are caused by hunting/trapping take, road kill mortality, and loss of habitat to development such as construction.

logging, and mineral and energy extraction activities, and poaching. Little or no information is available to quantify the effects of some of these actions on the different wildlife species populations. Nevertheless, such effects are already part of the existing human environment, and thus part of the "environmental status quo".

Another way to evaluate impacts of the federal action in this situation is to compare against the status quo for the human environment that would exist with no federal involvement in PDM in Colorado. The environmental status quo in this context is expected to include PDM and other types of wildlife management by nonfederal entities. Predators are managed under different federal, state, and, on occasion, local laws (Section 1.7). Unprotected wildlife species, such as most non-native invasive species, are not protected under state or federal law, while feral domestic animals are typically managed under State and local laws. Most State-resident wildlife species are managed under State authority or law without any federal oversight or protection. CDOW and CDA have authority to issue permits in Colorado for the take of certain wildlife species causing damage (including predators discussed in this EA). When a non-federal entity (i.e. CDOW, CDA, CDPHE, municipalities, counties, private companies, individuals, etc.) takes a management action on a State-resident wildlife species or unprotected wildlife species, the action is not subject to NEPA compliance due to the lack of federal involvement in the action. Under such circumstances, the environmental baseline or status quo must be viewed as an environment that includes those species as they are managed or impacted by non-federal entities in the absence of the proposed federal action. Therefore, in those situations in which a non-federal entity has decided that a management action directed towards a state protected or unprotected wildlife species will occur and even the particular methods that will be used, WS's involvement in the action will not affect the environmental status quo. WS's decision-making ability in such situations is restricted to one of two alternatives - either taking the action using the specific methods as decided upon by the non-federal entity, or taking no action at all at which point the non-federal entity will take the same action anyway.

The inability to change the *environmental status quo* in the types of situations described above presents a clear question of whether there is enough federal control over the action to be taken to make direct assistance by WS a federal action requiring compliance with NEPA. This lack of federal control over the decision to be made is even clearer when the non-federal entity has committed to taking the same actions in the absence of any federal assistance from WS. Clearly, under these circumstances, by any analysis we can envision, WS would have virtually no ability to affect the *environmental status quo* by selecting any possible alternative, even the alternative of no federal action by WS.

Therefore, based on the discussion above, it is clear that in those situations where a non-federal cooperator has obtained the appropriate CDA or CDOW permit or authority, and has already made the decision to remove or otherwise manage predators to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, however, certain aspects of the human environment may actually benefit more from WS's involvement than from a decision not to assist. For example, if a cooperator believes WS has greater expertise to selectively remove a target species than a non-WS entity; WS management activities may have less of an impact on target and nontarget species than if the non-federal entity conducted the action alone. Thus, in those situations, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

2.1.3 Connected Actions

Connected actions are the activities necessary to meet the need for action. The need for action in this EA is to protect resources from predators. WS conducts WDM in the state for other wildlife species, but only predators are included within the scope of this EA. Other WS WDM programs are not connected to PDM and they are not necessary to achieve the need for action. It has been suggested that livestock grazing, and damage associated with overgrazing, is a connected action to WS PDM. We address that issue in Section 2.3.9 further on.

2.1.4 Cumulative Actions

"Cumulative actions" are defined in CEQ's NEPA regulations as "actions which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement." (1508.25(a)(2)).

"Cumulative impact" is defined in those regulations as the "impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions ..." (40 CFR 1508).

In its June 24, 2005 guidance memorandum to federal agencies on the consideration of past actions in cumulative effects analysis, CEQ advised that agencies should:

"... focus on the extent to which information is 'relevant to reasonably foreseeable significant adverse impacts,' is 'essential to a reasoned choice among alternatives,' and can be obtained without exorbitant cost. 40 CFR 1502.22. Based on scoping, agencies have discretion to determine whether, and to what extent, information about the specific nature, design, or present effects of a past action is useful for the agency's analysis of the effects of a proposal for agency action and its reasonable alternatives."

CEQ also advised in that guidance that:

"Agencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effect of all past actions combined. Agencies retain substantial discretion as to the extent of such inquiry and the appropriate level of explanation. Generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions."

Accordingly, cumulative actions are activities that when combined with the proposed federal action, can be additive to create impacts (cumulative impacts) on the resources that are affected by the proposed federal action and include past, present, and reasonably foreseeable future activities on those affected resources. Cumulative impacts on the environment affected by WS PDM actions in CO include sport hunting/trapping activities, private PDM actions in CO, and potential growth of WS PDM actions in CO. These are discussed in relationship to each of the issues under the five alternatives. Of primary concern are the cumulative impacts to native wildlife species directly targeted and/or those species not targeted but directly affected by WS' PDM actions in CO, i.e., the potentially affected nontarget species addressed in this chapter. Thus, the cumulative impacts that are analyzed are those that affect the same environmental wildlife resources as those affected by WS PDM actions in CO and that are caused by past, present, and reasonably foreseeable future activities, regardless of who undertakes such activities.

A few commentors claim that impacts on wildlife resources caused by actions such as residential and commercial land development, oil and gas development, and timber harvesting are among the cumulative impacts that should be analyzed by WS as cumulative effects to be considered in reference to WS PDM actions in Colorado. We disagree since those actions typically do not directly affect the same wildlife resources that WS PDM actions affect. WS acknowledges that other types of actions may occasionally have some impacts on the wildlife species that WS impacts with its PDM actions but such impacts are usually only indirect and minor impacts. See section 2.3.4 for the complete discussion re this issue. Additional analysis of cumulative impacts of other actions (e.g., land development, oil and gas development, timber harvesting, grazing, aircraft overflights) are analyzed in Sections 2.3.2, 2.3.4, and 2.3.9).

2.1.5 Similar Actions

Actions similar to WS PDM, such as private landowners conducting PDM for themselves, are analyzed in this document where information is available. CDOW keeps take records on wildlife species for the depredation permits CDOW issues. However, several species can be hunted during the regular hunting seasons and the coyote year-round, and these animals are not recorded under depredation permits, but in hunter harvest. Hunter harvest is considered in cumulative impacts analysis, and thus is not considered here. As far as other issues related to privately conducted PDM, much information is unknown such as incidents with people and pets, nontarget take, effects on recreation, and so on. Therefore, the potential effects of privately conducted methods of PDM as similar actions to WS PDM can only be theorized from the best available information. For example, it has been well documented that landowners frustrated in attempts to capture damage-causing predators can resort to questionable or illegal techniques leading to potentially serious environmental impacts. This includes poaching (illegal hunting) of such predators and using illegal chemicals and methods. Obviously,

accurate reports of the extent of illegal wildlife control activities are not available as persons engaging in them cannot be expected to readily volunteer such information even when asked about it. However, it is reasonable to expect that such activities would be likely to increase if professional government-provided assistance in resolving wildlife damage problems was reduced, eliminated, or rendered less effective by excessive restrictions (USDA 1997).

2.1.6 Resources Not Impacted by WS PDM

The following resources within Colorado are not expected to be impacted to any consequential degree under any of the alternatives analyzed in this EA: soils, geology, minerals, water quality and quantity, floodplains, wetlands and other aquatic resources, visual resources, air quality, prime and unique farmlands, timber, and rangeland. Neither the current program nor the other 4 alternatives will cause major ground disturbance, physical destruction, or damage to property. They will not cause more than minor alterations of property, wildlife habitat, or landscapes, nor will they involve the sale, lease, or transfer of ownership of any property. Nor do the proposed methods have the potential to affect the character or use of historic properties through introduction of visual, atmospheric, or audible elements in area which they are used. These resources will not be further analyzed.

2.1.7 Irreversible and Irretrievable Commitments of Resources

No irreversible or irretrievable commitments of resources are expected, other than the minor use of fuels for motor vehicles and other equipment, and similar materials. These will not be discussed further.

2.2 ISSUES

The following issues or concerns about PDM have been identified through interagency planning and coordination, from the EAs which preceded this document, and from USDA (1997) as areas of concern that will be addressed in this EA.

- Effects on Target Predator Species Populations
- Effects on Nontarget Species Populations, Including T&E Species
- Impacts on Public Safety, Pets, and the Environment
- Effects of PDM, especially Aerial Hunting Activities, on the Use of Public Lands for Recreation

2.2.1 Effects on Target Predator Species Populations

Maintaining viable populations of all native species is a concern of the public and of biologists within the state and federal land and wildlife management agencies, including WS. The U.S. Government Accounting Office (1990) analyzed the effects WS PDM on predators in the western United States and determined that WS PDM activities had no overall effect on predator populations. However, a concern of some is that WS PDM will adversely affect populations of target species, which, for purposes of this EA are primarily coyotes, red fox, striped skunks, black bears, raccoons, feral dogs, mountain lions, and bobcats. Scoping during the EIS process (USDA 1997) revealed that some persons believe PDM interrupts the "balance of nature" and this should be avoided. Others believe that the "balance" has shifted to unfairly favor generalist species, including predators. Several species' populations have steadily increased over the past several years due to adaptability to human-made environments and damage from these species has increased accordingly (International Association of Fish and Wildlife Agencies 2004). To address these concerns, the effects of the alternatives on populations for each target species are examined. To fully understand the need for PDM, it is important to have a knowledge about the species that cause damage and the likelihood of damage. Full accounts of life histories for these species can be found in mammal reference books (e.g. Fitzgerald et al. 1994). Some background information is given here for the predator species in Colorado covered by this EA, especially information pertaining to their range in Colorado. The species are basically given in order of WS PDM efforts directed towards them, their

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subsequent take, and the occurrence and value of damage that the species cause in Colorado. Some of the lesser damaging species are lumped with others where life history and damage are somewhat similar. Finally, it should be noted that jurisdiction and management of these species mostly lies with CDOW which was discussed in Section 1.1, except that damage to agriculture by coyotes, wolves, foxes, bobcats, raccoons, mountain lions, bears, striped skunks, and opossums is CDA's responsibility. Additionally, most of the predators addressed in this EA have been harvested in Colorado by hunters and trappers afield. Historic harvest records (records prior to the passage of Amendment 14) provide valuable insight into these species abundance in Colorado (Table 5). It should be noted that even before the trap ban that hunting and trapping seasons were closed in 1995 for the gray, kit and swift foxes, spotted and hog-nosed skunks, weasels, mink, marten, ringtail, and opossum (few were incidentally taken following the season closures, but not included in Table 5).

Table 5. Historic take of furbearers, black bears, and mountain lions in Colorado (hunting and trapping) prior to the passage of Amendment 14 (L. Stevens, CDOW, *unpubl. data*, 2005).

	urbearers	taken dur	ing sports	men (hunt	ers and tra	ppers)and	l trapping	seasons in	Colorado	1.08	
Species	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Ave.
				Tra	pper Harv	est					
Badger	1,003	424	259	242	356	527	426	656	186	155	431
Bobcat	905	936	690	294	577	735	275	879	799	567	676
Coyote	11,619	5,728	4,107	4,099	NA	7,757	5,799	8,877	3,615	4,246	6,205
Gray Fox	783	879	339	120	399	477	392	576	xxx	xxx	509
Kit Fox	41	0	13	0	101	2	34	0	XXX	xxx	13
Red Fox	1,895	1,496	946	1,001	1,197	1,788	1,543	3,423	523	704	1,480
Swift Fox	583	265	153	166	300	300	361	279	xxx	xxx	301
Marten*	2,383	3,006	2,664	994	1,280	1,016	811	2,324	xxx	xxx	1,885
Mink*	307	246	247	244	143	282	166	774	xxx ′	XXX	324
Opossum	132	48	11	14	21	0	57	36	xxx	XXX	43
Raccoon	4,384	2,446	1,384	1,425	2,052	2,102	1,870	3,260	2,009	1,745	2,292
Ringtail*	261	237	106	34	158	115	292	131	xxx	xxx	168
E. Spotted Skunk	14	0	0	4	0	0	0	0	xxx	xxx	3
W. Spotted Skunk*	154	167	88	89	72	60	62	63	xxx	xxx	98-
Striped Skunk	3,490	2,052	1,563	1,293	1,098	2,426	1,404	6,233	450	279	2,132
Long-tailed Weasel*	68	287	343	106	60	64	106	334	XXX	xxx	187
Short-tailed Weasel*	7	29	58	9	-11	0	3	113	XXX	XXX	31
				Hun	iter Harve	st					
Badger	1,273	2,787	315	91	xxx	xxx	xxx	xxx	xxx	xxx	1,117
Black Bear	616	673	592	412	475	483	278	360	533	521	494
Bobcat	556	2,745	359	xxx	xxx	XXX	xxx	XXX	xxx	xxx	1,220
Coyote	22,599	22,463	29,805	22,397	23,987	26,707	36,259	25,954	21,840	29,002	26,101
Gray Fox	196	168	88	xxx	XXX	xxx	XXX	xxx	xxx	xxx	151
Swift Fox	1,627	438	44	xxx	XXX	xxx	xxx	xxx	xxx	xxx	703
Red Fox	1,116	2,011	44	xxx	XXX	xxx	xxx	1,314	875	2,586	795
Mountain Lion**	180	173	206	254	255	321	314	347	361	435	285
Opossum	246	240	309	55	NA	73	41	180	193	NA	167
Raccoon	3,108	7,698	5,850	13,912	1,485	7,119	3,892	4,331	1,355	4,444	5,319
Striped Skunk	7,895	10,458	11,172	8,434	4,730	3,197	3,139	9,715	NA	NA	7,343

^{*} Only trapping season open/hunting closed for this species

^{**} Includes depredation take

xxx - Trapping/Hunting season closed - not included in ave. NA - Not available or data unreliable Shaded data: data unreliable -actual data inaccurate - entered what is believed to be the actual numbers, but not used for average

2.2.1.1 Coyote. Coyotes are managed as a furbearer and protected by CDOW in Colorado, but can be taken year-round, though a limited season could be established at some time in the future. Of all predators in Colorado, coyotes kill the majority of livestock that is reported to or verified by WS, about 75%, and, therefore, a major focus of WS PDM efforts in Colorado. Coyotes were responsible for an average of \$220,000 damage to livestock, crops, and pets reported to or verified by WS in 421 complaints annually from FY00 to FY04. Coyotes averaged about 56% of all mammalian predator complaints in Colorado from FY00 to FY04. The resources protected, in order of reported economic loss included livestock, primarily lambs, calves, ewes, exotic game and poultry, crops, property (e.g. drip irrigation lines, pets) and human health and safety (i.e., concern for children and pet safety). Coyotes killed an average of 1,676 livestock annually from FY00 to FY04. In addition, coyote predation on other wildlife species in Colorado such as sandhill cranes, least terns, and mule deer and antelope fawns has created concern in some areas, but no value is presented here for such losses.

Coyotes were once found only in western States, but have expanded their range in recent history to much of North America as a result of changes in habitat, loss of wolves, and possible introductions into other parts of the country where they were previously not found (Bekoff and Wells 1982, Voigt and Berg 1999). They are very common in Colorado and found statewide at moderate to high density levels (USFWS 1978) with lowest densities in dense coniferous forests and highest in the eastern plains (Fitzgerald et al. 1994). They have consistently been the species most harvested by sportsmen in Colorado averaging 32,306 per year from 1987 to 1996. To discuss the impacts of various environmental constraints and external factors on coyote populations and density, it is essential to understand the basic mechanisms that play a role in the coyote's response to constraints and actions. This species is often characterized by wildlife biologists as having a unique resilience to change because they have a strong ability to adapt to adverse conditions and persevere. Habitat changes that have occurred over the last two hundred years often favor this species.

Determinations of absolute densities for coyote populations are frequently limited to educated guesses (Knowlton 1972). Coyotes are highly mobile animals with home ranges (territories) that vary seasonally and with the sex, age, and breeding status of the animal (Todd and Keith 1976, Althoff 1978, Pyrah 1984). The literature on coyote spatial organization is confusing (Messier and Barrette 1982, Windberg and Knowlton 1988). Coyote home ranges may vary from 2.0 mi² to 21.3 mi² (Andelt and Gipson 1979, Gese et al.19886). Ozoga and Harger (1966), Edwards (1975), and Danner (1976), though, observed a wide overlap between coyote home range and did not consider coyotes territorial. Each occupied coyote territory may have several nonbreeding helpers at the den during whelping (Allen et al. 1987, Bekoff and Wells 1982). Therefore, each defended coyote territory may have more than just a pair of coyotes. Messier and Barrette (1982) reported that from November through April, 35% of the coyotes were in groups of three to five animals and Gese et al. (1988) reported that coyote groups of 2, 3, 4, and 5 comprised 40%, 37%, 10% and 6% of the resident population, respectively. The presence of unusual food concentrations and nonbreeding helpers at the den can influence coyote densities, and complicate any effort to estimate abundance (Danner and Smith 1980). A positive relationship was established between coyotes densities in mid-late winter and the availability of dead livestock (Roy and Dorrance 1985).

To understand impacts of sportsmen harvest and depredation take on the coyote population, it is useful to have a relative idea of the population size. Coyote population estimates for Colorado were not available from Colorado agencies. However, an estimate suitable for purposes of analysis can be made using information on coyote biology and population dynamics, and tempering the "reasonableness" of the estimate by considering field observations of WS personnel. These types of estimates of carnivore populations are based on a knowledge of the species, experience, and intuition and may be as accurate as those based on more scientific methods (Fritzell 1999).

Many authors have estimated coyote populations throughout the West and elsewhere (Andelt 1985, Pyrah 1984, Camenzind 1978, Knowlton 1972, Clark 1972, USFWS 1979). Coyote population densities will vary depending on the

⁶ All literature citations reported in km² have been converted to mi² for reader convenience and to maintain consistency.

time of year, food abundance, and habitat. Coyote densities in some studies have ranged from a low of 0.4/mi² prior to whelping when populations are low (just prior to the annual period of pup birth) and a high of 3.6/mi² when populations are high (just after the period of pup birth) (Pyrah 1984, Knowlton 1972) to a high of 5/mi². Scent-post survey densities for Colorado from 1972 to 1977 averaged 110 coyote visits/1,000 scent posts in one of the most widespread studies undertaken on predator densities (USFWS 1979). Colorado had relatively moderate densities of coyotes; in general coyote populations decrease as you travel north in the 13 western States averaging 149 visits/1,000 scent posts in the southern tier of western States, 114/1,000 in central tier of western States, and 83/1,000 in the northwestern tier of States (Knowlton and Stoddart 1983). Coyote densities as high as 5/mi² have been reported in the Southwest (Voigt and Berg 1999). Knowlton (1972) estimated coyote densities West-wide to be an average of 0.5 to 1.0 per square mile over a large portion of the coyote's range. From predator surveys, Knowlton and Stoddart (1983) placed Colorado in a band of moderate abundance. The opinions of WS Specialists that conduct PDM in Colorado generally agree that coyote numbers in Colorado are relatively moderate with some areas of very high density. Although not substantiated by scientific field studies, Knowlton's (1972) 1.0 per square mile can be considered reasonable for the area and is very likely to be lower than true average densities across Colorado. Thus, "high average" for the western U.S. (Knowlton 1972), especially considering that scent post surveys performed in the 1970's in Colorado indicated high relative abundance (USFWS 1979), is assumed to be conservative for the area covered by the EA, but is used herein for the analysis. Colorado is 104,000 mi² in size and the covote is found throughout. A conservative estimate of the covote population for Colorado, based on what we believe to be a conservative assumption of 1.0 coyote per square mile, is 104,000 prewhelping. Under reasonable assumptions of a 50:50 sex ratio of males to females, that 43% of the females breed, and average litter size of 4.6 pups (Pitt et al. 2003), the post-whelping population would be about 207,000.

2.2.1.2 Foxes. CDOW is the agency responsible to oversee the management of foxes in Colorado, classified as a furbearers, but CDA is responsible for their damage to agriculture. Red fox currently have the only open hunting season of the foxes in Colorado. Red fox are found throughout much of North America and are common in varying abundance throughout most of Colorado, about 90% of the State. In the early part of the 1900s, red foxes were not as abundant in Colorado, basically found in the mountainous areas, but have expanded their range into all but the southeastern quarter of the Plains (Fitzgerald et al. 1994); their range has expanded as a result of red fox introductions from abandoned fur farms and probable expansion from the east into agricultural areas. Red fox eat mostly small mammals, birds, insects and mast, and will take small livestock and poultry. Of the foxes in Colorado, red fox create the most complaints and many involve livestock. Red fox have a home range of 1-2 mi², but often travel outside. Storm et al. (1976) stated that 95% of the females (43.6% were less than 1 year old) bred successfully in a population in Illinois and Iowa. Rowlands and Parkes (1935) and Creed (1960) reported that male red fox breed in their first year. Litter sizes averaged about 4.7 for 13 research studies and litters with as many as 14 and 17 offspring have been reported (Storm et al. 1976, Voigt 1999). Red fox usually den on slopes in porous soils and have 1 litter per year of 4-9 pups. Ables (1969) and Sheldon (1950) reported that more than one female was observed at the den and suggested that red fox have "helpers" at the den, a phenomena observed in coyotes and other canids. Some reported red fox population densities have been over 50/mi² (Harris 1977, MacDonald and Newdick 1982, Harris and Rayner 1986) where food was abundant. The density of red fox populations is difficult to determine because this species can be secretive and elusive. However, the red fox has a high reproductive rate and dispersal capacity similar to coyotes, and can withstand high mortality within the population (Allen and Sargeant 1993, Voigt 1999, Voigt and MacDonald 1984, Harris 1979, Pils and Martin 1978, Storm et al. 1976, Andrews et al. 1973, and Phillips and Mech 1970). Densities range from 0.3 (tundra)-80 (urban with abundant food)/mi² in studies (Voigt 1999).

Red fox are the most common and well-known species in the genus *Vulpes* and are the most widely distributed nonspecific predators in the world (Voigt 1999). Foxes are regarded as nuisance predators in many regions, preying on wildlife and livestock, and have become notorious in many areas of the world as carriers of diseases (Ables 1969, Andrews et al. 1973, Tabel et al. 1974, Tullar et al. 1976, Pils and Martin 1978, Sargeant 1978, Allen and Sargeant 1993, Voigt 1999). Red fox have been the subject of much study during the last 20 years. Investigations have revealed that red fox are extremely adaptive with much diversity in their behavior and habitats. Voigt and Earle (1983) and Gese et al. (1996) showed that red foxes avoided coyotes but coexisted in the same area and habitats. An average density for Colorado might be conservatively estimated at 1/mi² across 90% of Colorado (much of the available habitat (little alpine tundra and more agricultural, suburban, and disturbed habitat is available that is ideal for high population densities)

would fall at the higher end of the density range of 0.3-80/mi² (Voigt 1999)), or conservatively about 94,000 fox, with highest densities in suburban and agricultural areas. Red fox are a species that is harvested by sportsmen in higher numbers than most predator species, averaging 2,275 from 1987 to 1996 (data obtained from CDOW). Red fox were responsible for an average of \$3,800 damage and 24 requests for assistance annually from FY00 to FY04. They killed an average of 30 sheep and goats, 64 poultry, and 1 pet. They have also been responsible for 1 complaint annually involving property and 6 with human health and safety concerns.

Gray fox tend to prefer coniferous forests, chaparral and rimrock country with scattered pinyon-juniper and agricultural habitats. They primarily feed on small mammals, birds including poultry, mast, and insects. They have 3-7 pups and den in hollow logs, under rocks, and sometimes in underground dens. Gray fox are found in the foothills of the Eastern Slope, throughout southeastern Colorado, and at lower elevations in the western fifth of the State; they occupy about 35% of the State (Fitzgerald et al. 1994). The gray fox has expanded it range in recent times and probably at a higher population than its historic abundance. Harvest by sportsmen from 1987 to 1994 annually averaged 660. Published estimates of gray fox range from 3.1-5.4/mi² with densities probably lower over broader areas (Fritzell 1999). Since gray fox occur spottily throughout their range except in southern Colorado where they are more abundant, a density of 1.0/mi² over its range (a third of the lowest density estimate), would provide a conservative estimate of about 36,000 gray fox in Colorado. Gray fox in Colorado cause little damage and have only been responsible for an average of \$50 damage in less than 1 request for assistance annually (total 3) from WS from FY00 to FY04. Most damage from gray fox is related to poultry.

Swift fox and kit fox, although similar species, are found in entirely different habitats. Swift fox are a grasslands species whereas kit fox occupy desert areas. Both can be found sometimes on the fringe of agricultural lands. Both species prefer areas with loose-textured soils suitable for easily digging underground dens which are used throughout the year. These foxes are most common in areas that support large populations of prey such as black-tailed jackrabbits (Lepus californicus), cottontail rabbits (Sylvilagus spp.), rodents, especially kangaroo rats (Dipodomys spp.) and deer mice (Peromyscus spp.), birds, and insects. They reach reproductive maturity between 10 and 22 months of age and litters average 3-5 pups. Kit fox are found in western Colorado, primarily in Delta and Montrose Counties. They may also occur in the southwest corner of the State. Their habitat makes up about 2% of Colorado. However, much of their habitat has been lost to development and agriculture and it is likely that only about 25% of actual habitat remains. Swift fox are found in most of eastern Colorado, or about 35% of the State (Fitzgerald et al. 1994). Population density information is poorly understood for both species. Studies in California and Utah found kit fox densities anywhere from 0.25-6/mi² (O'Farrell 1999); a density of 0.25/mi² for Colorado would result in a population of 130 for their current range in about 0.5% of the state. CDOW has recently funded research on the swift fox to determine density indices in eastern Colorado (Finley 1999, Finley et al. 2005). These studies found in 2004-2005 an average density of 0.4/mi². The range of densities in 12 mi² grids found 0-26 kit fox/grid or 0-2.2/mi². Other information reported densities as high as 10/mi² in eastern Colorado for swift fox. Colorado had the highest mean harvest of states in their range before the trap ban (Scott-Brown et al. 1999). A conservative population estimate of density over their range 0.25/mi², the same as kit fox, would result in an estimated population of 9,100. Both species were reduced earlier in the century as a result of rodent and predator poisoning campaigns. However, both species of fox are increasing in areas of their range. From 1987 to 1994, an average of 1,004 swift fox and 13 kit fox were harvested annually by sportsmen in Colorado. Nationally, within these species respective ranges, WS receives very few requests for either fox species and takes very few targets (only 4 kit fox and no swift fox were taken as targets from FY96 to FY03 by WS nationally); WS in Colorado did not receive any requests for assistance for them from FY00 to FY04. The only other take for these species occurred in eastern Colorado by CDOW for a transplant program in South Dakota; 30 were captured and transplanted in 2003 and 28 in 2004. Neither of these two species represent much of an economical threat and cause few damage problems.

2.2.1.3 Skunks. Three species of skunks inhabit Colorado, the striped, Western spotted, and Eastern spotted skunks, and records exist for a fourth, the hog-nosed skunks, in southeastern Colorado; no hog-nosed skunks have been found since several were collected in the 1920s so they may not exist in Colorado any more. Additionally, Eastern spotted skunks are spottily distributed in its range, and in fact may be extirpated (Kahn 2001) Skunks primarily cause odor problems around homes, potentially transmit diseases such as rabies to humans and domestic animals, and sometimes prey on poultry and their eggs. Skunks are primarily targeted to reduce these types of problems and these activities are

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only a minor part of WS's PDM activities. The majority of damage complaints usually are because a skunk has sprayed in and around residences. Most of the complaints are probably from striped skunks, but the other skunk species may be at fault. Skunks have also been responsible for a few other types of damage. Though skunks usually do not cause considerable damage, striped skunks are consistently responsible for the fourth most number of complaints in Colorado averaging 36 complaints annually and \$200 damage to property and poultry from FY00 to FY04; an average of 30 of these complaints are for odor nuisances to humans and 1 for pets being sprayed. Western spotted skunks were responsible for only two complaints, both odor related, from FY00 to FY04. Complaints were not received for the other two species. Skunks are managed by CDOW and protected under Colorado wildlife laws; hunting and trapping seasons on the spotted and hog-nosed skunks have been closed since 1995.

All species of skunks have white on black pelage and have short, stocky legs with long claws on their feet for digging. Their most notable characteristic is the ability to discharge nauseating musk from their paired anal glands. The striped skunk is by far the most common in Colorado. It is a large skunk, up to 10 pounds, with two white stripes down its back. The hog-nosed skunk is similar in size to the striped skunk. It is distinguished by its elongated naked snout. It spends most of its time rooting for food. Hog-nosed skunks typically have one large white stripe down their back. The spotted skunks are the smallest typically not weighing much more than a pound and have a number of white spots covering their backs, sides, and head. The Western spotted skunk is differentiated from the Eastern by its smaller size and in Colorado by their range.

Striped skunks are found throughout the United States, including all of Colorado, and have expanded their range with the encroachment of people. Western spotted skunks are found spottily along the front range from about Denver south and in southern and western Colorado (about 30% of the State). Eastern spotted skunks are spottily found (possibly extirpated) in the South Platte and Arkansas River Valleys of far eastern Colorado in about 5% of the State. Hog-nosed skunks have only been found on rare occasions in south-central and southeastern Colorado and may no longer exist. Spotted skunks, and to lesser extent hog-nosed, will climb to elude danger and search for food. Skunks are found in a variety of habitats including woodlands, grasslands, desert, and chaparral. The striped skunk is, especially, associated with farmland and urban areas whereas the others are mostly associated with rocky areas such as in canyons and outcrops, or grasslands (Rosatte 1999). Skunks eat a variety of food including small rodents, insects, fruits, and eggs, and sometimes kill poultry. Skunks nest in underground dens, hollow logs, under buildings and in rock crevices. During the winter they will go through periods of inactivity, especially while it is bitter cold. They typically are solitary, except they may communally roost in the winter, especially the females, for warmth.

The home range of striped skunks is not sharply defined over space and time, but is altered to accommodate life history requirements such as raising young, winter denning, feeding activities, and dispersal (Rosatte 1999). Home ranges reported in the literature averaged between 0.85 to 1.9/mi² for striped skunks in rural areas (Houseknecht 1971, Storm 1972, Bjorge et al. 1981, Rosaette and Gunson 1984). The range of skunk densities reported in the literature was from 0.85 to 67/mi² (Jones 1939, Ferris and Andrews 1967, Verts 1967, Lynch 1972, Bjorge et al. 1981). Many factors may contribute to the widely differing population densities. Habitat type, food availability, disease, season of the year, and geographic area are only but a few of the reasons (Storm and Tzilkowski 1982). Overall, the striped skunk has the densest population of the four species of skunks in Colorado and can be found almost anywhere in the State. Striped skunks had the second highest harvest in Colorado from 1987 to 1996 at an annual average 9,475. With densities varying greatly and ideal habitat distributed throughout the state, an average of 4/mi² would be a conservative estimate. At this density, Colorado would have about 400,000 striped skunks. However, for the purposes of being very conservative, the lowest density 0.85/mi² in the literature will be used which results in an estimate of 88,000.

Spotted skunks are found in diverse habitats over the small portions of the state preferring rocky canyons and outcrops in woodlands and prairies, especially shrub habitats in broken country. They often take advantage of the food and cover in agricultural areas. Spotted skunks make their dens in cracks and crevices among rocks, woodrat nests, hollow logs, burrows under large rocks, and sometimes under buildings. Unlike striped skunks, spotted skunks are adept climbers. They are almost entirely nocturnal and seldom are seen in the daytime. A major difference in the two species are their breeding season; eastern's breed in spring whereas westerns breed in late summer and fall. The Western spotted skunk exhibits delayed implantation of the eggs meaning that the eggs do not implant until spring and they then give birth in

late spring or early summer following a 50-65 day gestation period. Additionally, the two species are geographically isolated, and though once believed to be the same species, they are now recognized as two separate species. Harvest data in Colorado was combined for the two species; however county data from 1987 to 1994 shows that 98 Western spotted skunks and 3 Eastern spotted skunks were harvested by trappers. The Western spotted skunk is found in about 30% of Colorado and the Eastern spotted skunk in about 3% of the State (Fitzgerald et al. 1994). Densities of spotted skunks are poorly known, but did average 5.7/mi² in appropriate habitat in Iowa (Crab 1948 *in* Rosatte 1999). If spotted skunk densities are conservatively estimated at the same low density as striped skunks (0.85/mi²), the populations could be estimated for Western spotted skunks at about 26,500 and 2,650 for Eastern spotted skunks.

Hog-nosed skunks occur or at least once occurred in the canyon country of southeastern Colorado in what would be the northernmost part of its range. They are common in the Southwest and across the border in New Mexico where they are found in warm woodlands, grasslands, and deserts which have rocky areas for denning (Roseatte 1999). Residential areas and farmlands are classified as secondary habitat (Thompson et al. 1992). The hog-nosed skunk's status in Colorado is relatively vague as Colorado represents its northernmost range and very few records have ever existed (Fitzgerald et al. 1994); it is doubtful that an extant population exists in the State or more evidence of them would have been recorded. A few probably wander into Colorado from time to time from New Mexico.

2.2.1.4 Black Bear. Black bear are protected as big game in Colorado and, as such, CDOW manages their population. CDA has management authority of black bears causing damage to agriculture. WS gives CDOW information on the take of all depredating black bears to help them determine population impacts from these activities. CDOW sometimes request WS to take bear when the need arises from a damage situation. CDOW contracts with WS to conduct bear damage management. WS receives calls from individuals and CDOW to remove bears that have caused damage. WS Specialists in Colorado responded to an average of 179 damage complaints annually from FY00 to FY04 involving 491 sheep (\$63,300), 13 cattle (\$6,400), 23 other hoofed stock (\$7,400), and 220 poultry (\$2,300), and an average of 2 complaints involving crops (\$2,980), 1 for other agricultural products, primarily bee hives (\$2,600), 2 for property (\$2,200), and 1 for human health and safety.

Black bears can be found throughout much of North America, including the Rocky Mountains. In Colorado black bears are found throughout the western two thirds of the State where highest population densities are found in the montane forests and cottonwood canyons of western Colorado (Fitzgerald et al. 1994). Black bears can live up to 25 years (Rogers 1976). Bears will eat a variety of foods including grass, fruits, nuts, carrion, livestock, mammals, insects, bees (especially the larva) and garbage; they may overturn rocks and logs looking for grubs and insects or small rodents. Recent research indicated they may also be a more efficient predator of large game than was previously believed (Pederson, 1988) along with livestock. In Colorado, the annual mortality rate was 0.44 for cubs, 0.06 for yearlings, 0.15 for subadults, and 0.12 for adults. Female black bears reach reproductive maturity at approximately 3.5 years (Kohn 1982, Graber 1981). Following a 7-8 month gestation period, they may have one to five cubs (Rogers 1976, Alt 1981, Kolenosky and Strathearn 1987). Juvenile black bear annual mortality ranges between 20 and 70 percent, with orphaned cubs having the highest mortality (Kolenosky and Strathearn 1999). Natural mortality in adult black bears is approximately 10-20 percent per year (Fraser et al. 1982). Their density will vary between 0.3-3.4/mi.2, depending on habitat (Kolenosky and Strathearn 1999). In the southwestern U.S., black bear population densities have been documented at 1/mi.² (LeCount 1982). In Colorado, densities are considered low at 1 bear/2-3 mi² (Fitzgerald et al. 1994). However, with the ban on use of trailing dogs, spring hunting, and baiting, it is likely that populations have increased as a result of decreased hunting efforts initially; hunter success has increased in Colorado in recent years. Black bears occupy about 50% of Colorado and a conservative population estimate using 1/3 mi² would be 17,000. However, CDOW estimates the bear population at 10,000-12,000, but it is thought to be conservative and lower than the probable population (J. Apker, CDOW, pers. comm. 2005).

2.2.1.5 Raccoon. Raccoons are a furbearer in Colorado and CDOW is responsible for oversight of raccoon management. CDA has authority for damage done to agricultural resources. They are abundant throughout North America, except Canada and the Rocky Mountains and Great Basin regions. They are typically associated with waterways and forested habitats, but have become especially common in urban areas. In Colorado, they are found most abundantly in suburban and urban areas, along waterways and in forests in the less arid portions of Colorado, they

sometimes can be found a long way from water in a variety of habitats including desert scrub. Since the 1940s, raccoon populations throughout the U.S. have increased, likely as a result of adapting well to man-made habitats. Raccoons are found throughout most of Colorado. Raccoon populations vary considerably, depending on habitat suitability. Twichell and Dill (1949) reported one of the highest densities where 100 raccoons were removed from a winter tree den area on 101 acres of a waterfowl refuge in Missouri. Other studies have found raccoon densities that ranged from 9.3/mi² to $80/\text{mi}^2$ (Yeager and Rennels 1943, Urban 1970, Sonenshine and Winslow 1972, Hoffman and Gottschang 1977, and Rivest and Bergerson 1981). Densities in Colorado average towards the lower end of the range over large tracts of land, $1.3-8.3/\text{mi}^2$ (Fitzgerald et al. 1994). Colorado probably has some ideal habitat areas with large number of raccoons, but statewide would average more towards a low density. Hunters and trappers annually harvested an average of 7,811 between 1987-96. A reasonable estimate for Colorado, using the lowest density figure statewide, would be about 135,000.

Raccoons are one of the most omnivorous of animals, feeding on carrion, garbage, birds, mammals, insects, crayfish, mussels, other invertebrates, a wide variety of grains, various fruits, other plant materials, and most or all foods prepared for human or animal consumption (Sanderson 1999). Raccoon damage problems, were reported an average of 23 times annually from FY00 to FY04 with about half related to human health and safety concerns (typically raccoons living in a residence). The remainder of damage recorded, about 11 complaints annually, was mostly to agricultural products and property, averaging about \$5,000 annually.

2.2.1.6 Feral Dog. Feral and free-roaming dogs are not common in Colorado, but problems from them can be extensive. Domestic dogs kill livestock and poultry, and WS responded to an average of 16 requests for assistance annually from FY00 to FY04. Most of the damage, averaging about \$8,000 annually, was to livestock and 15 of the 16 requests were to protect them. An additional request was for the protection of human safety. Free-roaming dogs are also known to prey on native wildlife such as elk, deer, and upland game and were responsible for 1 request from FY00-FY04. Primary responsibility for dog control rests with county and municipal authorities. It is WS policy to respond only to requests for controlling dogs that come from these local authorities, (i.e., county sheriff, municipal police, or health department) and CDOW. Since WS only responds at the request of local agencies, and many have animal control officers, WS receives relatively few calls concerning free-roaming or feral dogs and, thus, WS records only reflect minor damage for them. Feral dogs are not part of the native environment, and left abandoned in the wild are often considered ecological pests.

2.2.1.7 Mountain Lion. The majority of mountain lion complaints involve predation of livestock, pets, and, potentially, but rarely, people. Mountain lions were responsible for an average of over \$88,000 damage to livestock and wildlife (17% of all predator damage), and human health and safety concerns in an average of 50 complaints annually reported to or verified by WS from FY00 to FY04. Lions killed an average of 156 hoofed stock and 3 pets annually from FY00 to FY04 and were responsible for 3 human health and safety concerns each year. In addition, mountain lion predation on other wildlife species such as bighorn sheep and mule deer has created concern in some western states.

Mountain lions have an extensive distribution across western North America including Colorado, occupying about two thirds of the State (Fitzgerald et al. 1994). This species is known by several other names including panther, puma, catamount, and cougar. Mountain lions inhabit many habitat types in Colorado from desert to alpine environments, indicating a wide range of adaptability. They are closely associated with deer, elk, and other large hoofed mammal herds because they rely on these species for food. The mountain lion is a big game animal in Colorado. CDOW manages mountain lion populations and is responsible for compensating livestock losses. CDA has authority for the management of livestock losses to lions. They issue depredation permits when needed per Colorado regulations, but permits are not required prior to take of mountain lions threatening livestock. WS has been contracted by CDOW to assess damage and provide PDM for them as needed.

Female mountain lions typically breed for the first time between 22 and 29 months of age (Ashman et al. 1983) but initial breeding may be delayed until a territory has been established (Hornocker 1970). Mountain lions breed and give birth year round but most births occur during late spring and summer following about a 90 day gestation period (Ashman et al. 1983, Seidernsticker et al. 1973, Robinette et al. 1961). One to six offspring per litter is possible, with an average

of two to three young per litter.

Mountain lion density is primarily dependent on prey availability and intraspecific (between or among members of the same species) competition with other mountain lions. Prey availability is directly related to the habitat quality of the prey species and this directly influences a mountain lion's nutritional health, and reproductive and mortality rates. Studies indicate that as available prey increases, so do lion populations, but because mountain lions are territorial animals, the rate of population increase tends to decrease as lion density increases, even though the prey availability continues to increase. As the mountain lion population density increases, the mortality rate from intraspecific strife, cannibalism, and dispersal into marginal quality, unoccupied habitats also increases. Shaw (1981) presented evidence that livestock such as sheep and calves provide a supplemental prey base that supports mountain lions through seasonal declines in their primary prey which is normally deer. This allows an artificially high population level to be reached, especially during times of low wild prey availability. Although the relationship of the mountain lion to its prey can help mountain lion populations to increase, their behavioral relationships to other lions (e.g., intolerance) is a greater factor in determining peak density for a particular site. They typically do not reach density levels observed in a number of other wildlife species (Oregon Department of Fish and Wildlife 1993).

Mountain lion densities, based on a variety of population estimating techniques, range from a low of about 1/100 mi² (McBride 1976, Hemker et al. 1984) to a high of 24/100 mi² (Johnson and Strickland 1992). The average density estimate for western states was estimated at 7.5/100 mi² (Johnson and Strickland, 1992). Cunningham et al. (1995) determined that mountain lion densities were about 75% higher in the portion of their study area which was subject to greater depredation control and sport hunting. Their estimates of density ranged from 4-7/100 mi². However, studies that followed mountain lions for at least 12 months found that densities ranged from 0.13-0.013/mi². In Colorado, mountain lions were estimated to have a density of 0.04-0.1/mi² or about 3,000 to 7,000 which is within the range of the estimates for lions followed for at least 12 months. Using 7 mountain lions/100 mi² (the average density for Colorado), occupying 2/3 of Colorado, would provide an estimated population of about 4,850. CDOW (2004) estimates the population to realistically be between 4,500 and 5,000 mountain lions.

2.2.1.8 Bobcat. CDOW is the agency responsible to oversee the management of bobcats since it is designated as a furbearer, but WS can provide assistance to livestock owners. CDA has authority over the management of bobcats which depredate on livestock. WS works with CDA and CDOW to provide PDM to reduce bobcat damage. WS provides CDOW with information on take as they are the management agency for the species. The confirmed and reported damage caused by bobcats in Colorado from FY00 to FY04 was almost exclusively to livestock in an average of 4 damage occurrences. The total average annual value of these losses was over \$1,300 with an average of 220 poultry and 4 sheep killed annually.

Bobcats are found in much of North America, excluding much of Canada and the East, but are most abundant in western States. They are typically associated with rimrock and chaparral habitat, but can be found in other habitats such as forests. They are found statewide in Colorado, but have their highest densities in western and southeastern Colorado. Bobcats reach reproductive maturity at approximately 9 to 12 months of age and may have one to six kittens following a two-month gestation period (Crowe 1975, Koehler 1987). They may live up to 14 years, but annual mortality is as high as 47% (Rolley 1985). Sportsmen harvested an annual average of over 1,896 bobcats in Colorado from 1987 to 1996. Bobcat population densities range between $0.1/\text{mi}^2$ and $7/\text{mi}^2$ according to published estimates (Rolley 1999). Using the low density estimate for all of Colorado would estimate a population of about 10,000.

2.2.1.9 Badger. Badgers are classified as a furbearer in Colorado and managed by CDOW. Badgers are found throughout most of the western States and are found in Colorado at moderate densities. Badgers occur in practically all habitat types in Colorado. They prefer open habitats and avoid densely wooded areas, although they will enter forest margins. Badgers occur in grasslands, meadows in subalpine and montane forests, alpine tundra, and semi-desert shrublands (Fitzgerald et al. 1994) Their distribution is typically associated with fossorial (below ground) prey such as prairie dogs (*Cynomys spp.*) and ground squirrels. The smallest and largest estimated sustainable yield rates mentioned in the literature are 18% and 33%, respectively (Cook 1986). Sportsmen harvested about 1,548 badgers annually from 1987 to 1996 in Colorado. Density estimates range from 1/mi² to 13/mi² (Messick 1999). Using a very conservative

estimate 1/mi² in about 50% of the state that provides suitable habitat, Colorado would have 52,000 badgers. WS occasionally takes badgers as target species, most often for the protection of rangeland, pasture, and cropland damage. From FY00 to FY04, badgers were responsible for \$400 damage in an average of 1 damage occurrence per year.

- 2.2.1.10 Feral Cat. WS periodically takes feral cats in PDM activities. Feral cats are fairly common throughout Colorado. However, Colorado WS responds to few requests for assistance for them; an average of 1 complaint annually was received from FY00 to FY04 and almost entirely for nuisance problems with people. Primary responsibility for feral cat control rests with county and local authorities. WS responds only to requests from these entities as well as health departments to target feral cats. WS personnel are authorized to control feral cats to protect livestock, poultry, natural resources and human health and safety when requested by the proper authority. Feral cats are not part of the native environment, and left abandoned in the wild are often considered an ecological pest and very efficient predators competing with native wildlife.
- 2.2.1.11 Opossum. CDA manages opossum damage to agriculture. CDOW manages the opossum and damage to non-agricultural related resources. Currently hunting seasons for them are closed. The opossum is native to three river basins in eastern Colorado and have expanded their range in these areas in the late 1900s most likely as a result of agriculture. They have also been introduced elsewhere in Colorado such as in Grand Junction (Fitzgerald et al. 1994). They typically are associated with riparian areas and inhabit deciduous woodlands, cottonwood forests, pinyon-juniper woodlands, farmlands, old fields, grasslands, marshlands, agricultural and forested edges, and desert plains; they have also been reported in mountainous areas. Opossums are omnivorous and have a wide-ranging diet. Females breed the first season following their birth and produce potentially two litters per year in Colorado. They may have as many as 25 young, but average between 6 and 9. Most opossums die in their first year and turn-over is expected by their third year. Opossum populations can fluctuate dramatically. The opossum is protected as a furbearer in Colorado, but few are usually taken as such. From 1987 to 1996, an average of 210 were harvested by sportsmen (the trapping season ended in 1995). Colorado WS receives few requests for assistance for opossum, and only received 2 from FY00 to FY04; one was a nuisance and the other an agricultural related problem. Opossums occupy about 7% of the state and their density ranges from 1.3/mi² to 20.2/mi² with an average of 10.1/mi² (Seidensticker et al. 1999). Using the low density estimate of 1.3/mi², about 9,500 would inhabit Colorado.
- 2.2.1.12 Weasels. Both long-tailed and short-tailed weasels are found in Colorado and CDOW has management authority over weasels as they are classified as furbearers. The long-tailed weasel is more common and found in much of the continental U.S. including all of Colorado (Fitzgerald et al. 1994). They are found in a wide variety of habitats, usually brushy and rocky, and typically in close association with water. Long-tailed weasels are found at densities of 1/mi² in large areas including non-preferred habitats to as many as 98/mi² in appropriate habitat (Fagerstone 1999). Using the most conservative estimate, Colorado would have a minimum of 104,000 long-tailed weasels. The short-tailed weasel is found mostly in northern North America and is found in the high country (above 6,000 ft.) of central Colorado covering about 40% of the State in mixed coniferous forest and alpine tundra associated with moist areas (Fitzgerald et al. 1994). Densities for short-tailed weasels varied from 10/mi² to 16/mi² in preferred habitats (Fagerstone 1999). If their preferred habitat covered 10% of the their range (about the area near water) and were inhabited by the typical densities of short-tailed weasels, then Colorado would support 40,000. Both primarily feed on small mammals and some birds. Trappers harvested an annual average of 187 long-tailed weasels and 31 short-tailed weasels from 1987 to 1994. WS occasionally receives damage complaints for weasels, and invariably it is for the long-tailed weasel, and most always for poultry predation. WS only received 2 complaints from FY00 to FY04 involving the long-tailed weasel.
- 2.2.1.13 Feral Domestic Ferrets. The domestic or European ferret is frequently sold as pets and may be released into the wild or escape captivity. WS nationally gets only a few requests for assistance with ferrets annually. Once feral, they feed on small rodents, rabbits, and potentially poultry to survive. Feral ferrets are not part of the native environment, and left abandoned in the wild are often considered an ecological pest. They are very uncommon in the wild, but they are sometimes encountered. WS in Colorado did not receive any requests for assistance from FY00 to FY04 for feral ferrets.

2.2.1.14 Marten. Although widespread in North America, pine marten populations suffered declines in localized areas due to over-exploitation for furs and loss of habitat from lumbering operations and other activities. CDOW is the agency responsible for regulating take of this furbearer, but it is currently not harvested in the State. In Colorado, this animal is fairly abundant in the high country, primarily in central and western Colorado north to south in about 20% of the State (Fitzgerald et al. 1994). Marten occur in spruce-fir forests and marginal alpine habitat where they feed on small mammals, particularly red squirrels (*Tamiasciurus douglasii*), birds, insects and mast. They climb and spend much of their time in trees, usually avoiding open areas. Males and juveniles appear the most susceptible to trapping (Strickland and Douglas 1999). Density studies basically found a range of 1/mi² to 5/mi² (Strickland and Douglas 1999); at the low estimate, 20,000 marten would inhabit Colorado. Trappers harvested an annual average of 1,885 martens from 1987 to 1994 indicating their relative abundance. Typically the only damage that marten do is raiding mountain cabins. WS did not receive any requests for assistance with marten from FY00 to FY04.

2.2.1.15 Mink. CDOW is the agency responsible to oversee the management of mink in Colorado as they are classified as furbearers, but currently the season is closed on them. Mink are found across much of northern North America and in scattered areas of Colorado (Fitzgerald et al. 1994). Mink have never been very abundant in Colorado. They are associated with lakes, streams, and marshes and are expert swimmers. They feed on small mammals, birds, eggs, fish, insects, and amphibians and are especially prevalent where crayfish and muskrat (Ondatra zibethicus) are abundant. Mink are typically found within a half mile of riparian habitat. They have had reported densities of 8.5/mi² to 22/mi² in wetland habitat and densities of 2.5 to 6 per mile of stream shoreline, but methods of estimating their density have varied greatly and have inherent inaccuracies (Eagle and Whitman 1999). In northwestern Colorado, mink density was estimated at 1.7/mi² (McKean and Burkhard 1978 cited in Fitzgerald et al. 1994). Since Colorado has low densities of mink statewide, a conservative estimate would be half that from the literature or about 0.85/mi² or about 90,000 mink in Colorado. However, considering the fact that they are basically aquatic, another estimation could be made using information on densities in differing wetland habitats. A conservative estimate would be 2.5 mink per mile of perennial stream and 8.5/mi² of lakes and other impoundments. Colorado has approximately 31,470 miles of perennial (yearround) rivers and streams, and 260 mi² in perennial bodies of water including the larger reservoirs and lakes (D. Litke, USGS, pers. comm. 2001). Colorado has many more wetlands that would likely support mink. With these assumptions, the mink population would be estimated to be about 80,000, a similar estimate. Trappers harvested an annual average of 324 from 1987 to 1994. Damage complaints for mink are usually associated with poultry and fish predation, but WS has not received a complaint for this species in recent years.

2.2.1.16 Ringtail. Ringtails are protected as a furbearer by CDOW; currently there is no season on them. The ringtail is found in most of southern and western Colorado at lower elevations in about 60% of the State. It is found in rimrock, desert, and rocky ridge habitats in close association with water. Ringtails feed on small mammals, birds, lizards, insects, and mast. Trappers in Colorado took an average of 168 ringtails from 1987 to 1996. Densities of ringtails in the literature vary greatly from 0.2/mi² to 51.8/mi², but many of these were determined prior to 1950. Estimates from a Utah study in the late 1970s, with habitat similar to some areas in Colorado where they occur, were reported as 3.9-7.5/mi² (Kaufmann 1999). However, using the lowest density estimate of 0.2/mi², Colorado would have an estimated 12,500 ringtails which is likely very conservative. Because of their habitat choice and secretive nature, ringtails seldom become a problem, but have been known to become a nuisance in and around human habitations. WS had no complaints for ringtails from FY00 to FY04, but did have a few nationally.

2.2.2 Effects on Nontarget Species Populations, Including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is the possible impact of PDM methods and activities on nontarget species, particularly T&E species, and the effects of aerial hunting overflights on wildlife. SOPs of WS include measures intended to reduce the effects of PDM on nontarget species populations, especially T&E species, and are detailed in Chapter 3. The effectiveness of PDM methods to capture target species, yet reduce capture of nontarget species may vary widely depending on local circumstances at the time of application (e.g. target and nontarget species are similar in weight and in the same area). Some PDM methods may be more or less effective or applicable depending on experience of the user, weather conditions, time of year, biological considerations, economic considerations, legal and administrative restrictions, or other factors.

2.2.2.1 Nontarget Species Taken by WS in PDM and Potential Nontargets. From FY00 to FY04, WS took 11 different nontarget species, averaging 5 different species per year (Table 6). Most nontarget species taken during PDM (10 of 11 species taken from FY00 to FY04) are other predator species that were not targeted during a specific operation or were not the specific individual targeted, but on the cooperative agreement. Information on target predator species was discussed in 2.2.1. Only 1 other nontarget species was taken between FY00 and FY04, the porcupine (*Erethizon dorsatum*). Porcupines are found in the western 3/4 of Colorado, most in coniferous forest habitats and some in agricultural areas and shrublands (Fitzgerald et al. 1994). They are locally abundant in many areas of Colorado. In 1989, sportsmen harvested 4,625 in Colorado, giving an indication of their abundance.

WS has the potential of capturing other nontarget species. Species that are of similar or more weight and size than the species targeted can be taken with several of the PDM methods used. Other species such as white-tailed jackrabbits (*Lepus townsendi*), black-tailed jackrabbits, mule deer, and yellow-bellied marmots (*Marmota flaviventris*) have been previously been taken in Colorado or surrounding States, and could potentially be taken during PDM. However, none were taken from FY00 to FY04. This is primarily a result of the increased selectivity of PDM methods used such as pantension devices used on traps. Species with the highest potential to be taken as a nontarget species, with the exception of the T&E and candidate species presented in Table 7, are relatively common in Colorado, either locally or statewide.

Table 6. All nontarget species taken by WS during PDM for FY00 to FY04 on all land classes in Colorado.

4.5 1.72			No	ntarget S	pecies Kill	ed by WS	in FY00-I	Y04				
YEAR	FY00		FY00 FY01		FY	FY02		FY03		FY04		rage
Species	Killed	Freed	Killed	Freed	Killed	Freed	Killed	Freed	Killed	Freed	Killed	Freed
Raccoon	-	4	7	7	2	2	3	-	3	1	3	3
Striped Skunk	1	-	3	-	2	-	-	-	. 8	-	3	0
Swift Fox	-	-	1	-	-	-	4	-	-	1	1	0
Red Fox	-	-	2	-	-	-	-	-	2	- ,	1	. 0
Badger	1	-	2	-	-	-	-	-	-	-	1	0
Bobcat	-	-	-	-	3	-	-	-	-	-	1	0
Feral Dog	-	-	1	5]	-	-	-	-	3	0	2
Gray Fox	-	-	1		1	-	-	-	-	_	0	0
Porcupine	-	-	-	-	-	-	-	-	1	-	0	0
Feral Cat	-	-	-	-	-	-	-	-	-	2	0	0
Mountain Lion	-	-	-	ı	-	-	-	-	-	-	0	0
Tetal	2	4	17	13	9	2	7	0	14	7	10	5

2.2.2.2 Potential T&E Species Impacts. Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects of WS PDM activities and the establishment of special restrictions or measures to reduce the potential for take. Colorado has 5 mammals, 7 birds, 6 fish, 2 butterflies, and 13 plants Federally listed as T&E species. Additionally, 3 birds, 1 amphibian, 1 fish, and 6 plants are candidates for the Federal list. One species, the California condor, was reintroduced as an experimental/nonessential population in the Grand Canyon area. Several have temporarily migrated outside the boundaries of the experimental zone; three temporarily came into Colorado in 1998 near Grand Junction (USFWS 2001). Finally, the State of Colorado lists an additional 4 mammals, 2 birds, and 6 fish as T&E species. WS PDM has the potential to have an adverse effect on 12 species of mammals and birds and a positive effect on 10 species of mammals and birds (Table 7). WS PDM will have no effect on 1 mammal, 6 birds, and all listed amphibians, fish, butterflies, and plants (USDA 1997).

WS received a Programmatic Biological Opinion in 1992 (USDA 1997, Appendix F) on the potential for WDM, in general, to impact the species listed nationwide, including those in Colorado. USFWS, consulted under Section 7 of the ESA, issued BOs on the species that WS had the likelihood to adversely affect. WS abides by the reasonable and prudent measures and alternatives, and terms and conditions established in the BOs which reduce the potential for take (USDA

1997, Appendix F). The Canada lynx was listed following the consultation and could potentially be taken as a nontarget species. Colorado WS has never taken a lynx incidentally. WS completed formal consultation on the lynx under Section 7 of the ESA in Colorado and received a BO from the FWS dated August 23, 2005:

Table 7. Federal and State listed T&E and Federal candidate mammals and birds in Colorado and the potential for WS PDM activities to have an effect on them.

SPECIES	Scientific Name	Listing	Status	Habitat	Diet***	PDM
	MAMMALS					
Bear, grizzly*	Ursus arctos	SE	H	FR	VG	0
Ferret, black-footed*r	Mustela nigripes	FE FXE SE	R	R	V	-, 0, +
Fox, kit	Vulpes macrotis	SE	R	R	V	-, 0, +
Lynx, Canada*r	Lynx canadensis	FT SE	R	F	V	0. +
Mouse, Preble's meadow jumping**	Zapus hudsonius preblei	FT ST	HR	W	Gi	0
Otter, river*r	Lontra canadensis	ST	R	W	F	-, 0
Wolf, gray*	Canis lupus	FE SE	R	FR	Vc	-, 0
Wolverine*	Gulo gulo	SE	R	F	VC	-, 0
	BIRDS					
Condor, California	Gymnogyps californianus	FXE	V	FR	С	-, 0,+
Crane, whooping	Grus americana	FE SE	M	R	Giv	0
Cuckoo, Western yellow-billed	Coccyzus americanus	FC	S	F	I	0
Curlew, Eskimo*	Numenius borealis	FE	M	R	I	0
Eagle, bald	Haliaeetus leucocephalus	FT ST	SM	FW	FCv	-, 0
Flycatcher, Southwestern willow	Empidonax traillii extimus	FE SE	S	FW	I	0
Grouse, Plains sharp-tailed	Tympanuchus phasianellus jamesii	SE	R	R	GI	-, 0, +
Owl, burrowing	Athene cunicularia	ST	S	R	IV	-, 0, +
Owl, Mexican spotted	Strix occidentalis lucida	FT ST	R	F	V	0
Plover, piping	Charadrius melodus	FT ST	S	W	I	0, +
Prairie-chicken, lesser	Tympanuchus pallidicinctus	FC ST	R	R	Gi	-, 0, +
Sage-grouse, Gunnison	Centrocercus minimus	FC	R	R	GI	-, 0, +
Tern, least	Sterna antillarum	FE SE	S	W	Fi	0.+

^{*} Native population believed extirpated: * - Reintroduced

^{***}Diet - Capitals = large proportion of diet - Lower case = small proportion of diet

LISTING	STATUS	HABITAT	DIET	PDM - Impacts
F - Federal	H - Hibernate/estivate	F - Forests/riparian borders	C- Carrion	(-) - Negative
S - State	M - Migrant	R - Rangeland/sage/grass/agric.	F- Fish	0 - none
E - Endangered	R - Resident	W - Wetlands/marshes	G - Grains/grass/seeds/mast	(+) - Positive
T - Threatened	S - Summer/nests		I - Invertebrates/insects	
C - Candidate	V - Vagrant		V - Vertebrates	

X - Exp./Noness. Pop

Table 7 lists both Federal and State listed mammalian and avian species in Colorado. PDM will have no effect on several of these species including the Preble's meadow jumping mouse, whooping crane, Western yellow-billed cuckoo, Eskimo curlew, Southwestern willow flycatcher, and Mexican spotted owl. Some of these could be affected by other types of WDM activities, but will be unaffected by PDM and will therefore not be considered further in this EA. Amphibians, fish, invertebrates, and plants are also unaffected by PDM, and will not be discussed further in this EA. Following is background information on those species that potentially could be affected, positively or negatively, by some aspect of PDM.

Grizzly Bear. Prior to colonization by Europeans, grizzly bears roamed all of Colorado (Fitzgerald et al. 1994). The last document grizzly was killed in 1979 when it attacked a bow hunter. Prior to that, two were taken in 1951. It is suspected that the grizzly has been extirpated from the state and, therefore, PDM will have no effect on them. In September 1989, the Colorado Wildlife Commission passed a resolution opposing the reintroduction of grizzly bears into Colorado, until such time that Colorado is included in a federal recovery plan and it receives favorable public opinion. If grizzlies were still found in the state, PDM has the potential of negatively affecting them and were covered

^{**} Will potentially be delisted

in the USFWS 1992 BO (USDA 1997).

Black-footed Ferret. Black-footed ferrets were once found amidst prairie dog colonies in Colorado, though they were thought to be fairly rare (Fitzgerald et al. 1994). They were thought to be extinct with the last known captive ferret dying in captivity in 1979. In 1981, a new population was found in northwestern Wyoming. These ferrets were taken into captivity when many began dying of distemper. The captive breeding program that was established with the original 19 ferrets has produced over 3,000 ferrets which now they have been reintroduced into 6 states. Ferrets were reintroduced into northwestern Colorado in 2001. These black-footed ferrets appear to be surviving. It is doubtful, though remotely plausible, that an actual wild population still exists in Colorado today. Black-footed ferrets could be negatively and positively affected by PDM. WS has never taken a black-footed ferret.

Kit Fox. The kit fox was discussed in Section 2.2.1.2. It is very unlikely that kit fox would be the target of a PDM project, but it is possible because they have been in other WS programs in their range. This would be coordinated with CDOW because it is a State endangered species. It is believed, though once a little more plentiful, that fewer than 100 kit fox survive in Colorado from Montrose to Grand Junction. The kit fox has been protected since 1994. It is unlikely that the kit fox will ever recover in Colorado due to loss of suitable habitat, but it is doing well where an expanse of habitat exists. Kit fox can be both negatively and positively affected by PDM.

Canada Lynx. Lynx occur in the boreal forests of North America where it is highly associated with its primary prey, the snowshoe hare (*Lepus americanus*). The species is abundant and common in Canada and Alaska where the core of its range occurs, and suitable lynx habitat consists of montane and subalpine forest ecosystems. At one time, lynx occurred in several states, including Colorado. The lynx became endangered under State law in Colorado in 1973, coincidentally, the last year that a lynx was documented to be taken in Colorado. USFWS federally listed the Canada lynx as threatened in its historic range in the lower 48 contiguous states in 2000. Colorado represents the extreme southern edge of the range of the lynx.

CDOW in coordination with several other agencies and organizations began a reintroduction program in 1999 using lynx that were captured in Alaska and Canada and brought into the State. The entities involved in the reintroduction program determined the ideal location of a "Canada Lynx Recovery Area" in Colorado to be in southwestern Colorado. CDOW is currently tracking 83 of the possible 108 surviving lynx from the 166 adult lynx released from 1999 to 2004 (Shenk 2003, 2004, R. Kahn, CDOW, pers. comm. 2005). Reproduction was confirmed for the first time in 2003 with 16 kittens being found by CDOW and 36 more kittens in 2004 (Shenk 2004). It is anticipated that almost 100 more lynx will be reintroduced in the State from 2005 to 2008.

Lynx can potentially be both negatively and positively affected by PDM. WS nationally has only taken 1 nontarget lynx. That lynx was taken by the Idaho WS Program in 1991 in non-lynx habitat and was released alive. In the same time frame, WS nationally took 74,419 target coyotes (ave. of 2,481/yr) and 3,142 target bobcats (ave. of 105/yr) in leghold traps. Because lynx are similar to bobcats, use of leghold traps to capture coyotes and bobcats in areas of lynx habitat could potentially result in nontarget take of lynx. Because WS currently abides by Amendment 14 trapping and toxicant prohibitions for PDM on public lands, Colorado WS personnel do not use PDM methods that have the potential for impacting lynx in lynx habitat because most lynx habitat is in National Forests. The only PDM methods currently used by WS on federal public lands in the State utilize shooting which is virtually 100% target species specific. Therefore, this further reduces the potential for taking a lynx in Colorado. The USFWS has granted WS authorization for incidental take of 2 lynx through December 31, 2008. However, WS has never taken a lynx accidentally in Colorado and we consider the risk of take to be highly unlikely under current circumstances in the State.

River Otters. Otters were once widely distributed in Colorado, but were believed to be extirpated in the early 1900s. Otters prey on a variety of animals but prefer fish and crayfish. River otter, a State threatened species, have been successfully reintroduced into Colorado and were recently downlisted from endangered. The reintroduction sites, where more than 100 were released included Cheesman Reservoir, and the Gunnison, Piedra, Dolores, and upper Colorado rivers. They now can be found in aquatic environments in much of western Colorado. River otter could be negatively

affected by PDM.

Gray Wolf. The gray wolf was extirpated from much of the lower 48 continental United States by the 1930's. Gray wolves were once common in Colorado, but disappeared as a result of a campaign to rid the United States of livestock destroyers that was started in the late 1800s. Although, reports are received periodically of sighted wolves, most are likely wolf dog hybrids intentionally released by owners. In September 1989, the Colorado Wildlife Commission passed a resolution opposing the reintroduction of wolves into Colorado until the state is included in a federal recovery plan with favorable public views. Wolves were reintroduced into Idaho, Montana and Wyoming and the Mexican subspecies into Arizona and New Mexico as outlined in the USFWS Wolf Recovery Plan as nonessential/experimental populations. The populations of wolves at both reintroduction sites have been growing. As a result of the potential for wolves to disperse into Colorado, CDOW created guidelines to respond to their discovery (CDOW 2005b). As part of the guidelines, WS will be notified regarding verified wolf sightings and will document livestock or other losses.

In 2004, a working group was enlisted by CDOW to hold public meetings and to recommend rules regarding the dispersal of wolves into Colorado from either of the recovery areas. The Colorado Wolf Management Working Group (2004) came up with recommendations for wolf management should they disperse into Colorado. In the process of the public meetings and writing recommendations, a two year old female wolf was killed by a vehicle on I-70 west of Idaho Springs in June 2004 originating from a reintroduced population in Yellowstone. This was the first wolf documented in Colorado since the mid-1930s. Wolves outside the designated experimental population area, including those believed to have originated from the nonessential experimental population, are treated as a T&E species. Gray wolves in northwestern United States were downlisted from endangered to threatened April 1, 2003 when the USFWS updated its evaluation of gray wolves and designated all gray wolves, including Colorado north of I-70, as threatened (68 FR 15803-15875). However, a recent court ruling, (*Defenders of Wildlife v. Secretary, U.S. Department of Interior, 03-1348-JO, D. Or.*) found that the downlisting of wolves was done inappropriately and are still considered endangered. The Mexican gray wolf is still listed as endangered. Wolves could be negatively affected by PDM, but Colorado currently does not have an extant population.

Wolverine. The largest member of the mustelid family (i.e., weasels, skunks, badgers) was probably never common in Colorado (Fitzgerald et al. 1994). Wolverines were found in higher elevation forests and alpine tundra. They most likely disappeared from Colorado in the early 1900s (CDOW 2004). Wolverines feed on carrion, and small birds and mammals. Some evidence suggests that they could still persist in Colorado. However, the last documented wolverine sighting was reported in 1979 near the Colorado-Utah border. Habitat protection and reintroduction could be considered to establish a viable population in the future. The historic range of wolverines and their habitat in Colorado mostly preclude them from being taken in PDM. Wolverines could be negatively affected by PDM, but they have been considered extirpated from the state. Therefore, considering these facts, WS should have no effect on them.

California Condor. The California condor was extirpated over most of its range by the late 1970s and all wild condors were taken into captivity in 1980s. The propagation program was a success and they were reintroduced back into the wild in California. In addition, a nonessential/experimental population under ESA section 10(j) was been established at the Vermillion Cliffs of northern Arizona. The experimental range included areas in Arizona, Utah, and Nevada. Reports indicate that several of these condors have temporarily migrated outside of their experimental population zone including 3 into Colorado. Once outside of the experimental population area they are considered an endangered species under the ESA. The California condor is strictly a scavenger, eating carrion such as cattle, sheep, deer, and ground squirrel carcasses. The condor finds carrion by sight and not smell, unlike a turkey vulture which relies as much, or more, on odor to locate dead animals as it does sight. They have been known to be killed by predators, primarily coyotes. PDM, therefore, could have both negative and positive impacts on their population should they become established in Colorado. Any impact would be minimal since a true population does not exist in the state, only temporary vagrants.

Bald Eagle. Bald eagles are generalized predators/scavengers primarily adapted to edges of aquatic habitats. They feed primarily on fish (taken both alive and as carrion), waterfowl, mammalian carrion, and small birds and mammals. The bald eagle is a wide-ranging raptor found in all lower 48 contiguous states during some point in its life cycle. It is a bird

of aquatic ecosystems, frequenting estuaries, large lakes, rivers, reservoirs and some seacoast habitat. Bald eagles currently nest in 47 of 48 contiguous states including Colorado, and their numbers continue to increase from a low of about 500 nesting pairs in the mid-1960's to over 6,000 pairs today. They are also now a very common winter resident (700-900)in Colorado with many living on lakes and rivers throughout the State. PDM has a potential for negatively impacting bald eagles.

Plains Sharp-tailed Grouse, Lesser Prairie-chicken, and Gunnison's Sage-grouse. The State endangered and two federal candidate species, respectively, tend to prefer fairly open habitat in eastern and southwestern Colorado where they feed on insects and grains. Decline in these species has primarily been linked to a loss of habitat and, potentially, other factors (Arritt 1997). As numbers are reduced, predation can play a factor in their abundance. All three species can be negatively and positively affected by PDM similarly.

Burrowing Owl. The burrowing owl lives in abandoned rodent, mainly prairie dog, and rabbit burrows in sparsely vegetated areas of Colorado. Of the PDM methods in use, fumigants used for coyote and fox dens could potentially take an owl. PDM in areas inhabited by burrowing owls could potentially be a benefit to them, but no studies have found this.

Piping Plover and Least Tern. The federally listed plover and tern are found primarily from March through September in southeastern Colorado. The plover feeds primarily on invertebrates, and the tern feeds on invertebrates and fish. They nest on sandy beaches, especially on islands. They are not negatively impacted by PDM, and can benefit from PDM where predation from species such as raccoons has been identified as a limiting factor for a particular colony.

2.2.3 Impacts on Public Safety, Pets, and the Environment

A formal risk assessment of WS methods concluded low risks to humans (USDA 1997, Appendix P) including PDM methods used by WS in Colorado such as traps, snares, firearms, aerial hunting, immobilization drugs, and chemical toxicants. The use of chemical drugs and toxicants by WS is regulated by EPA under FIFRA, CDA Pesticide Control Laws, and WS Policies and Directives. Under several of the alternatives proposed in this EA, WS would use sodium cyanide in the M-44 device and carbon monoxide produced from the gas cartridge used for fumigating coyote, skunk, and fox dens. WS used 371, 472, 127, 51, and 22 M-44s and 17, 8, 8, 6, and 5 gas cartridges from FY00 to FY04 for an average of 209 M-44s and 9 gas cartridges used annually. Based on a thorough Risk Assessment, WS concluded that when WS chemical methods including those referenced above are used in accordance with label directions, they are highly selective for the target individuals or populations. WS use of these pesticides in PDM has negligible impacts on the environment and do not represent a risk to the public (USDA 1997).

On the other hand, public health and safety may be jeopardized by not having a full array of PDM methods for responding to complaints involving threats to human health and safety such as direct physical attacks on humans from predators, disease transmission, and airstrike hazards. Predators have been responsible for attacks on humans and WS has responded to complaints involving coyotes, feral dogs, and bears in the past 5 FYs. Sometimes predator attacks can be fatal, but rarely. For example, in 1991, a mountain lion killed a jogger near Idaho Springs, Colorado. Large predators such as coyotes represent a significant strike risk to aircraft at airports and have been struck by aircraft. This can result in damage and injuries to people. Finally, disease, especially rabies, can be a significant threat to humans. Diseased wildlife can be very difficult to treat. WS often uses several PDM methods to capture offending animals, depending on the specifics of these types of situation. Firearms, traps, snares, or chemical toxicants may be used to take an offending animal and eliminate further encounters. PDM methods that may pose a slight public safety risk may be used effectively to eliminate a recognized public safety risk.

Additionally, it has been found that without the use of WS services people will often resort to the unwise or illegal use of methods to resolve predator problems. This has been demonstrated many times and records of arrests involving people trying to protect their resources are replete (discussed in Section 2.2.3).

2.2.4 Effects of PDM, Especially Aerial Hunting Activities, on the Use of Public Lands for Recreation

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Some members of the public believe that WS PDM activities conflict with recreation on public lands. Recreational activities include hunting, fishing, wildlife viewing, sightseeing, horseback riding, camping, hiking, fuelwood gathering, skiing, snowmobiling, and boating among others. In addition, some individuals believe their recreational experiences on public lands are impaired by knowing that any lethal PDM actions are occurring on these lands. Others feel that they are being deprived of the aesthetic experience of viewing or hearing coyotes or other predators because of WS PDM actions. On the other hand, some believe that PDM is wholly acceptable. PDM can help bolster certain species populations of T&E species and big game, and eliminate individual predators that are a threat to human health and safety.

2.2.5 Issues that Were Analyzed in Prior EAs (WS 1997b, 1999a, 2001) that Will Not Receive Detailed Analysis Under the Alternatives in This EA, but Some Background Information Will Be Discussed

In addition to the above issues, several other issues were analyzed thoroughly in the previous EAs (WS 1997b, 1999a, 2001), and their analyses would be almost identical in this EA so these will not be considered further. The environmental consequences of these issues were found to have the least impacts under the current program alternative, the same in this EA except this EA is being considered at the statewide level. Even though these issues are not analyzed in this EA, some of these issues are still considered in determining SOPs to reduce potential impacts. Following are the issues that were sufficiently discussed and show little or no change. Subsequently, these will not be addressed in this EA, except where SOPs are developed to minimize impacts of these issues.

2.2.5.1. Selectivity and Humaneness of PDM Methods. Selectivity of PDM methods is related to the issue of humaneness in that greater selectivity results in less perceived suffering of nontarget animals. The selectivity of each method is based, in part, on the skill and discretion of the WS Specialist in applying such methods and also on specific measures and modifications designed to reduce or minimize nontarget captures. The humaneness of a given WDM method is based on the human perception of the pain or anxiety caused to the animal by the method. How each method is perceived often differs, depending on the person's familiarity and perception of the issue as discussed in Section 2.2.5. The selectivity and humaneness of each alternative are based on the methods employed and who employs them under the different alternatives. With the passage of Amendment 14, the pool of experienced private predator trappers is diminishing because recreational trapping is no longer allowed; this would increase the number of inexperienced trappers using PDM methods.

Schmidt and Brunson (1995) conducted a public attitude survey in which respondents were asked to rate a variety of WDM methods on humaneness (1=not humane, 5= humane) based on their individual perceptions of the methods. Their survey found that the public believes that nonlethal methods such as animal husbandry, fences, and scare devices were the most humane and traps, snares, and aerial hunting were the least humane. Previous EAs (WS 1997b, 1999a, 2001) discussed how selective each of the methods used in Colorado to take target animals was and information on their humaneness.

In comparison, under the No Federal Program Alternative, the federal portion of WS would not employ methods viewed by some as inhumane and, thus, have no program effect on humaneness. CDA and CDOW would probably still provide some level of hands on professional PDM assistance, but without federal supervision. They would continue to use the PDM methods considered inhumane by some, but at lower levels. State WS personnel would no longer receive training from federal sources, nor would the program benefit from federal research focused on improved humaneness, selectivity, and non-lethal methods. Private individuals that have experienced resource losses, but are no longer provided professional assistance from WS, could conduct lethal PDM on their own. Use of leghold traps, snares, and shooting by private individuals would probably increase. This could result in less experienced persons implementing PDM methods such as traps without modifications like underpan-tension devices that exclude smaller nontarget animals. Greater take or suffering of both nontarget and target wildlife would likely be the result. Therefore, it was concluded that the No Federal Program Alternative would result in the highest potential for negative PDM effects (WS 1997b, 1999a, 2001). Additionally, it is hypothetically possible that frustration caused by the inability of resource owners to reduce losses could lead to the illegal use of chemical toxicants. The illegal use of toxicants could also result in increased animal suffering.

PDM conducted by private individuals would probably be less humane than PDM conducted under the auspices of a federal PDM program. WS is accountable to public input and humane interest groups often focus their attention and opposition on PDM activities employed by WS. PDM methods used by private individuals may be more clandestine. Members of the public that perceive some PDM methods as inhumane would be less aware of PDM activities being conducted by private individuals because private individuals would not be required to provide information under mandatory policies or regulations similar to those applied to WS. Thus, the perception of inhumane activities could be reduced, although the actual occurrence of PDM activities may increase.

Under the No Federal PDM Alternative, livestock predation rates would be expected to increase. It has been determined that livestock losses are expected to be 4 times higher in areas without effective PDM (USDA 1997). Therefore, more domestic animals, including livestock and pets, would suffer inhumanely from injuries caused by predation than under the current program.

The No Federal Program Alternative would likely result in more negative impacts with regard to humaneness than the current program. The other alternatives analyzed in this EA were also analyzed in previous EAs (WS 1997b, 1999a) and found to lie between the Current Program and No Federal Program Alternatives. These will not be discussed further, but are used as a factor to help determine the appropriate SOPs to maximize selectivity and humaneness.

2.2.5.2. The Potential for PDM to Cause Increases in Rodent, Rabbit, and Other Prey Species Populations to the Point That Detrimental Effects on Vegetation Resources Occur. An issue that often comes up is the fact that PDM will cause increases in rodent, rabbit, and other prey species populations and that these species will have detrimental effects on vegetation resources. This issue was discussed thoroughly in previous EAs (WS 1997b, 1999a) and found not to have significant impacts; USDA (1997) did not specifically deal with this issue. In general, it appears that predators prolong the low points in rodent population cycles and spread the duration of the peaks. Predators generally do not "control" rodent populations (Keith 1974, Clark 1972, Wagner and Stoddart 1972). It is more likely that prey abundance controls predator populations, especially a species such as the lynx which exhibits a classic predator-prey relationship with the snowshoe hare. The USFWS (1979, p. 128) concluded that "WS Program activities have no adverse impacts to populations of rodents and lagomorphs."

Other prey species of coyotes include white-tailed deer, mule deer, bighorn sheep, and pronghorn antelope. Based on the information presented in Section 1.3.3.6, it is clear that local short term predator population reductions can enhance these populations. This could be either a beneficial or detrimental effect depending upon whether local big game populations were at or below the habitat carrying capacity (the ability of a habitat to support a species). However, as stated above, since WS conducts PDM on less than 10% of the land in the analysis area and takes less than 5% of the coyote population annually, WS does not have substantial impacts on the coyote population. Thus, WS would not have impacts on game species unless WS intentionally were trying to suppress the coyote population in a targeted area such as at fawning/lambing grounds at the request of or in concert with CDOW. The total take of coyotes in Colorado could be beneficial to deer and antelope to some degree, but mostly in fawning and wintering areas. It is unlikely that positive effects on deer or antelope populations would be significant, except in isolated instances where PDM was intense enough to ensure that a local coyote population covering the breadth of deer and antelope fawning or wintering area was suppressed. If CDOW, a Tribe, or other entity requested coyote removal for the purpose of enhancing antelope or deer herds, an increase in local populations would be desired and considered a beneficial impact on the human environment. In those situations, it is likely that coyote control would be ended when herd management goals were met.

2.2.5.3 Impact of PDM on Private Recreational and Commercial Fur Harvest. Another issue that was discussed thoroughly in previous EAs (WS 1997b, 1999a) was the impact that PDM would have on sportsmen. Game and nongame wildlife populations are not significantly impacted by WS PDM take allowing hunters ample opportunities for pursuit during seasons set by CDOW. Recreational trapping of predators is not an option because it was banned in Colorado by the passage of Amendment 14. WS PDM is highly directed to target individuals and species in a given area, mostly on private lands, and can be conducted in low to high density predator areas. Typically, WS works on a property until damage is controlled. This can take longer than sportsmen would tend to stay or be allowed to legally harvest in a given area. Additionally, WS only conducts PDM in a small portion of Colorado (usually less than 5% of the State).

Private fur harvesters tend to hunt where furbearer populations are high. When the only monetary benefit is fur value, they cannot make a profit by pursuing individual depredating coyotes in local areas where numbers are low. In addition, furs are only prime in the winter months and are not of value at other times of year when PDM is frequently needed. The typical strategy of private fur takers is to hunt the more easily lured animals in a population, which would tend to be the younger and less experienced animals, and to move on to other areas. With coyotes, older individuals are the most prone to being livestock and wild ungulate killers (Connolly et al. 1976; Gese and Grothe 1995). Thus, offending animals may not be taken before the private fur taker moves on, which means depredation losses would often be about as severe as they would without private fur harvest. This issue remained basically the same under all of the alternatives.

2.3 ISSUES USED TO DEVELOP WS SOPS FOR PDM

2.3.1 Effects on Target Predator Species Populations

WS annually monitors target predator take in PDM and sport harvest to determine if take has remained within the boundaries set by the EAs (WS 1997b, 1999, 2001). Thus far in Colorado, WS has not exceeded a significant level of take. This EA could easily disregard this issue because WS has consistently shown insignificant impacts to predator populations through analyses. However, predator populations and abundance can change, and, therefore, their populations would be considered and monitored annually. WS SOPs, discussed in Section 3.4, ensure that the take of predators remains below a sustainable harvest, unless the managing agency has different management goals.

2.3.2 Effects on Nontarget Species Populations, Including T&E Species

Special efforts are made to avoid taking nontargets during PDM or jeopardizing T&E species. The selectivity of PDM methods has been improving through the years, and much credit goes to WS's National Wildlife Research Center. Improved padded-jaw traps, pan-tension devices, trap lures, break-away snares, and other tools have helped WS Specialists be more efficient and effective at trapping the target species while minimizing capture of nontarget species. T&E species are avoided by conducting biological evaluations of the potential effects and the establishment of special restrictions or measures to reduce the potential for take, and consultation with USFWS and CDOW biologists. WS SOPs include measures intended to reduce the effects of PDM on nontarget species populations, especially T&E species, and are presented in Section 3.4.

2.3.3 Impacts on Public Safety and the Environment

WS Specialists have SOPs to reduce potential safety impacts from PDM to the public and the environment. WS relies on its Specialists to use their professional judgment to determine the most effective methods to use in a given predator damage situation, while having minimal, if any, impact to people and the environment. WS Specialists are professionally trained to use PDM techniques, especially those that could have the potential to impact themselves, the public, and the environment. Several PDM methods have the potential to be hazardous including firearms, pyrotechnics, and predacides. Measures to reduce potential problems are given in Chapter 3.

On the other hand, one peripheral factor pertinent to assessing the risk of adverse effects of WS PDM activities is the potential for adverse effects from not having professional assistance from programs like WS available to private entities that express needs for such services. WS operates to assist individuals with damage from predators where a need exists. In the absence of a program, or where restrictions prohibit the delivery of an effective program, it is most likely that PDM would be conducted by other entities such as private individuals. Private PDM activities are less likely to be as selective for target species, and less likely to be accountable. Additionally, private activities may include the use of unwise or illegal methods to control predators. For example, in Kentucky a corporation was fined for illegally using carbofuran to destroy unwanted predators including coyotes and raptors at a private hunting club (Porter 2004). Similarly, on a Georgia quail plantation, predatory birds were being killed by eggs that had been injected with carbofuran (the Federal Wildlife Officer 2000); in Oklahoma, Federal agents charged 31 individuals with illegally trapping and killing hawks and owls to protect fighting chickens (USFWS 2003). The Texas Department of Agriculture has a website and brochure devoted solely to preventing pesticide misuse in controlling agricultural pests (Texas Department of Agriculture 2004).

Similarly, the Britain Department for Environment, Food and Rural Affairs has a "Campaign against Illegally Poisoning of Animals" (Dacko 2004). Therefore, WS believes that it is in the best interest of the public, pets, and the environment that a professional PDM program be available because private resource owners could elect to conduct their own control rather than use government services and simply out of frustration resort to inadvisable techniques.

2.3.4 Effects of PDM, Especially Aerial Hunting Activities, on the Use of Public Lands for Recreation

Measures and policies are in place that help minimize the effects of WS activities on recreation. WS personnel post signs in prominent places to alert the public that PDM tools are set in an area. On private lands, the cooperators or landowners are aware that PDM methods are set and can alert guests using the property of their presence. Landowners determine the areas and timing of equipment placement, thereby avoiding conflicts with recreationists. For public lands, WS abides by all applicable laws and regulations regarding the use of different PDM methods. WS coordinates with the different land management agencies to determine high public use areas and times of the year (for example, hunting seasons). High use recreational areas are mostly avoided or the types of equipment used are limited. These areas are designated in WPs so PDM does not unnecessarily interfere with recreational activities. WS avoids conducting PDM in high-use recreational areas except for the purposes of human health and safety.

2.3.5 Humaneness of Methods Used by WS

The issue of humaneness and animal welfare as it relates to killing or capturing wildlife is an important and very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns if ". . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process." Suffering is described as a "... highly unpleasant emotional response usually associated with pain and distress." However, suffering "... can occur without pain ..." and "... pain can occur without suffering ..." (American Veterinary Medical Association 1987). Because suffering carries with it the implication of a time frame, a case could be made for ". . . little or no suffering where death comes immediately..." (California Department of Fish and Game 1991), such as shooting. Defining pain as a component of humaneness and animal welfare in PDM methods used by WS appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would "... probably be causes for pain in other animals ..." (American Veterinary Medical Association 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (California Department of Fish and Game 1991). Pain and suffering, as it relates to damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering since "... neither medical nor veterinary curricula explicitly address suffering or its relief' (California Department of Fish and Game 1991).

The American Veterinary Medical Association states "... euthanasia is the act of inducing humane death in an animal" and "... the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness." (Beaver et al. 2001). Some people would prefer accepted methods of euthanasia to be used when killing all animals, including wild and feral animals. The American Veterinary Medical Association states that "For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but use terms such as killing, collecting or harvesting, recognizing that a distress-free death may not be possible." (Beaver et al. 2001).

Some individuals and groups are opposed to some management actions of WS. WS personnel are experienced and professional in their use of management methods. This experience and professionalism allows WS personnel to use equipment and techniques that are as humane as possible within the constraints of current technology. Professional PDM activities are often more humane than nature itself (i.e., death from starvation) because these activities can produce quicker deaths that cause less suffering. Research suggests that with some methods, such as restraint in leghold traps, changes in the blood chemistry of trapped animals indicate "stress." Blood measurements indicated similar changes in foxes that had been chased by dogs for about five minutes as those restrained in traps (USDA 1997). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in

evaluating humaneness. People concerned with animal welfare often express that they would like to see animal suffering minimized as much as possible and that unnecessary suffering be eliminated. The interpretation of what is unnecessary suffering is the point to debate (Schmidt 1989).

Humaneness, as perceived by the livestock industry and pet owners, requires that domestic animals be protected from predators because humans have bred many of the natural defense capabilities out of domestic animals. It has been argued that man has a moral obligation to protect these animals from predators (USDA 1997). Predators frequently do not kill larger prey animals quickly, and will often begin feeding on them while they are still alive and conscious (Wade and Bowns 1982). The suffering apparently endured by livestock damaged in this manner is unacceptable to many people.

Thus, the decision-making process involves tradeoffs between the above aspects of pain and humaneness. Objective standard operating procedures to minimize impacts from this issue must consider not only the welfare of wild animals, but also the welfare of humans if damage management methods were not used. Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

WS has improved the selectivity of management devices through research and development of pan-tension devices, break-away snares, and chemical immobilization/euthanasia procedures that minimize pain. Research continues to improve selectivity, practicality, and humaneness of management devices (USDA 1997). Until such time as new findings and products are found to be practical, a certain amount of animal suffering will occur if PDM objectives are to be met in those situations where nonlethal PDM methods are ineffective or impractical. Furthermore, if it were possible to quantify suffering, it is possible that the actual net amount of animal suffering would be less under the proposed action (or any other alternative involving the use of lethal methods) than under the No Federal PDM Alternative since suffering experienced by livestock preyed upon by predators is reduced if PDM is successful in abating predation. Measures to reduce pain and stress in animals and SOPs used to maximize humaneness are listed in Chapter 3.

2.3 ISSUES CONSIDERED, BUT NOT IN DETAIL FOR EACH ALTERNATIVE WITH RATIONALE

Several other issues were addressed in previous EAs (WS 1997b, 1999a, and 2001) as issues not considered in detail with rationale. No new information has arisen that would change the analysis provided in those documents or suggest a need for their inclusion here in the issues considered in the comparison of alternatives. Therefore, the analyses for the following issues can be found in the previous EAs and will not be repeated here.

- WS's impact on biodiversity.
- Livestock losses should be an accepted cost of doing business (a threshold should be reached before providing PDM service).
- No PDM at taxpayer's expense (PDM should be fee based).
- The indiscriminate killing of coyotes often disturbs stable coyote populations, thus encouraging opportunist animals far more likely to kill livestock.
- The appropriateness of manipulating wildlife for the benefit of hunters or recreation.
- Appropriateness of using rancher-supplied data to quantify livestock losses.
- WS's removal of coyotes exacerbates the livestock depredation problem because the coyote population

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reduction results in greater reproduction.

- Cost of providing PDM services for livestock protection compared to the value of livestock losses avoided.
- PDM in Wilderness Areas.
- Effects on eagles from using lead shot during aerial hunting.

Additional issues have arisen since the last EAs were written. They are presented in Section 2.3.1 with justification given for not conducting a detailed analysis at this time.

2.3.1 Concerns that the Proposed Action May Be "Highly Controversial" and Its Effects May Be "Highly Uncertain," Both of Which Would Require That an EIS Be Prepared

The failure of any particular special interest group to agree with every act of a Federal agency does not create a controversy, and NEPA does not require the courts to resolve disagreements among various scientists as to the methodology used by an agency to carry out its mission (*Marsh vs. Oregon Natural Resource Council*, 490 U.S. 360, 378 (1989)⁷). As was noted in the 1996 FONSI: "The effects on the quality of the human environment are not highly controversial. Although there is some opposition to PDM, this action is not highly controversial in terms of size, nature, or effect." If in fact a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared.

2.3.2 Impacts on Wildlife Species Populations Caused by Low-level Flights during Aerial Hunting

Concern is sometimes expressed that aerial hunting might disturb other wildlife species populations to the point that their survival and reproduction are adversely affected and thus lead or contribute in some significant way to population declines. A number of studies have looked at responses of various wildlife species to aircraft overflights. The National Park Service (1995) reviewed many such studies and revealed that a number of them have documented responses by certain wildlife species that suggest adverse impacts could occur. Few, if any studies, have proven that aircraft overflights cause significant adverse impacts on wildlife populations, although the report stated it is possible to draw the conclusion that impacts to populations are occurring. The Air National Guard (ANG) came to the conclusion that military training flights were not expected to cause adverse effects on wildlife after extensive review of numerous studies of this issue (ANG 1997a, 1997b).

2.3.2.1 Low-level Flight Impacts on Wildlife. We reviewed a number of studies and analyses of the effects of low-level flights on a number of animal species:

Birds

Waterbirds and Waterfowl. Low level overflights of 2-3 minutes in duration by a fixed-wing airplane and a helicopter produced no "drastic" disturbance of tree-nesting colonial waterbirds, and, in 90% of the observations, the individual birds either showed no reaction or merely looked up (Kushlan 1979). Conomy et al. (1998) quantified behavioral responses of wintering American black ducks (*Anas rubripes*), American wigeon (*A. americana*), gadwall (*A. strepera*), and American green-winged teal (*A. crecca carolinensis*) exposed to low-level flying military aircraft in North Carolina and found that only a small percentage (2%) of the birds reacted to the disturbance. They concluded that such disturbance was not adversely affecting the "time-activity budgets" of the species. Other reviews have suggested there may be adverse effects on waterfowl (National Park Service 1995). WS aerial hunting activities are not conducted over wetland habitats, and a majority of such flights occur in winter when waterfowl and waterbirds have migrated further south. Thus, there is little to no potential for any adverse effects on these types of species.

Raptors. Mexican spotted owls (Delaney et al. 1999) did not flush when chain saws and helicopters were greater than 110 yards away; owls flushed to these disturbances at closer distances and were more prone to flush from chain saws than helicopters. Owls returned to their predisturbance behavior 10-15 minutes following the event and researchers observed no differences in nest or nestling success (Delaney et al. 1999) which indicates that helicopter flights did not result in adverse effects on owl reproduction or survival.

Andersen et al. (1989) conducted low-level helicopter overflights directly at 35 red-tailed hawk (*Buteo jamaicensis*) nests and concluded their observations supported the hypothesis that red-tailed hawks habituate to low level flights during the nesting period; results showed similar nesting success between hawks subjected to such overflights and those that were not. White and Thurow (1985) did not evaluate the effects of aircraft overflights, but found that ferruginous hawks (*B. regalis*) are sensitive to certain types of ground-based human disturbance to the point that reproductive success may be adversely affected. However, military jets that flew low over the study area during training exercises did not appear to bother the hawks, nor did the hawks become alarmed when the researchers flew within 100 feet in a small fixed-wing aircraft (White and Thurow 1985). White and Sherrod (1973) suggested that disturbance of raptors by aerial surveys with helicopters may be less than that caused by approaching nests on foot. Ellis (1981) reported that five species of hawks, two falcons (*Falco spp.*), and golden eagles (*Aquila chrysaetos*) were "incredibly tolerant" of overflights by military fighter jets, and observed that, although birds frequently exhibited alarm, negative responses were brief and the overflights never limited productivity.

Regarding potential effects of WS aircraft overflights on bald eagles, ANG (1997a) analyzed and summarized the effects of overflight studies conducted by numerous Federal and state government agencies and private organizations. These studies determined that military aircraft noise initially startled raptors, but negative responses were brief and did not have an observed effect on productivity (Ellis 1981, USFS 1992, Fraser et al. 1985, Lamp 1989, cited in ANG 1997a). A study conducted on the impacts of overflights to bald eagles suggested that the eagles were not sensitive to this type of disturbance (Fraser et al. 1985). During the study, observations were made of over 850 overflights of active eagle nests. Only two eagles rose out of either their incubation or brooding postures. This study also showed that perched adults were flushed only 10 percent of the time during aircraft overflights. Evidence also suggests that golden eagles are not highly sensitive to noise or other aircraft disturbances (Ellis 1981, Holthuijzen et al. 1990). Finally, one other study found that eagles were particularly resistant to being flushed from their nests (Awbrey and Bowles 1990, cited in ANG 1997a). Therefore, there is considerable evidence that eagles would not be adversely affected by WS aerial hunting overflights.

The above studies indicate raptors are relatively unaffected by aircraft overflights, including those by military aircraft which produce much higher noise levels than the small aircraft used in aerial hunting. Therefore, we conclude that WS aerial hunting flights have little or no potential to adversely affect raptors.

Passerines. Reproductive losses have been reported in one study of small territorial passerines ("perching" birds that include sparrows, blackbirds) after exposure to low altitude overflights (Manci et al. 1988 cited in ANG 1997a), but natural mortality rates of both adults and young are high and variable for most passerines. The research reviewed indicated passerine birds cannot be driven any great distance from a favored food source by a non-specific disturbance, such as military aircraft noise, which indicates the much quieter noise of WS small planes would have even less effect. Passerines avoid intermittent or unpredictable sources of disturbance more than predictable ones, but return rapidly to feed or roost once the disturbance ceases (Gladwin et al. 1988, USFS 1992). These studies and reviews indicate there is little or no potential for WS overflights to cause adverse effects on passerine bird species.

Sage Grouse. We could find no studies of the effects of overflights on sage grouse. However, impacts are probably minor when overflights only occur on an infrequent basis and care is taken to avoid leks (strutting grounds used by males during the breeding season) because State wildlife agencies routinely use aircraft to locate sage-grouse leks. The USFWS reviewed available scientific and other information on threats to sage-grouse and did not identify aerial overflights as a concern, although they did identify other types of activities such as off-road vehicles and recreation as potentially having disturbance effects on breeding (USFWS 2005). Because WS avoids flying near known or observed lek locations during the strutting season, disturbance effects on breeding are most likely avoided. One potential benefit to sage-grouse

is that WS aerial crews can watch for and report any new lek locations to the CDOW or land management agencies who can then take other actions to protect such sites from other, more potentially more chronic sources of disturbance, when appropriate. The USFWS determined earlier in 2005 that the greater sage-grouse is not currently warranted for listing as threatened or endangered (USFWS 2005). The Gunnison Sage Grouse, which is a federal candidate for listing, is most abundant in sagebrush habitats in Gunnison County, but they also inhabit suitable sagebrush habitats in Dolores, San Miguel, Montrose, and Saguache counties in southwestern Colorado. WS aerial hunting activities have occurred in 3 of those counties (Gunnison, Montrose, and San Miguel) in the past 3 years (See Table 9 further below). Since WS aerial hunting crews watch for and avoid leks during the breeding season, no adverse effects on sage grouse are expected from aerial hunting activities.

PDM activities that remove coyotes and red fox (species taken during WS aerial hunting in CO) may actually benefit sage grouse and other prairie grouse species. Although Autenrieth (1981) suggested that nest predation was likely the most important population constraint on sage grouse, predation on adult birds does occur and may be significant in some cases. Presnall and Wood (1953) reported tracking a coyote approximately 5 miles to its den in norther Colorado, and finding evidence along the way that the coyote had killed 3 adult sage grouse and destroyed a sage grouse nest. Examination of the stomach contents from an adult female coyote removed the next day showed parts of an adult sage hen, plus 6 newly-hatched sage hen chicks. The area around the den site was littered with sage hen bones and feathers. No other prey animal remains were found around the den, and it appeared that the pups had been raised largely upon sage grouse. Till (1982) documented sage grouse remains at 4 of the 30 covote den sites examined during his study in south central Wyoming, but provided no indication of the relative abundance or distribution of sage grouse in his study area. In northern Utah, researchers from Brigham Young University confirmed predation, primarily by red fox and coyote, as the cause of death for 13 of 21 radio-instrumented sage grouse in the first year in their study area (Bunnell and Flinders 1999). Two additional instrumented birds could not be found but were suspected to have been killed by predators, suggesting a 71% predation loss of instrumented birds. Additionally, 11 other sage grouse were found dead in their study area, and all but 1 of these birds were killed by mammalian predators. We are not aware of any studies conducted to determine if covote and red fox control would actually result in significant benefits to grouse populations. However, the above studies indicate there may be some benefit to the removal of these predators in some situations.

A potential indirect effect on sage grouse of coyote removal that has been identified is "meso-predator release", which is the increase in smaller mammalian carnivore species after larger carnivores have been reduced or eliminated. Concerns have been expressed that red fox populations might increase in areas of sage grouse habitat where coyote removal is conducted and that red fox would be worse predators of sage grouse than coyotes (Gunnison Sage-grouse Rangewide Steering Committee 2005). The "meso-predator release" theory allows that smaller predators are allowed to increase due to either a lack of predation or release from competition or both. Gehrt and Clark (2003) present an opposing view of "meso-predator release" and point out several weaknesses in the circumstantial evidence that has been used to suggest that meso-predator release occurs.

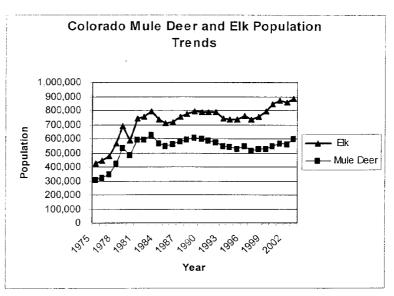
Gunnison Sage-grouse Rangewide Steering Committee (2005) cited studies of red fox and coyote home ranges in duck breeding areas of North Dakota as evidence that red fox numbers may increase if coyote numbers are reduced. Sargeant, et. al. (1984) reported on the effects of red fox predation on breeding ducks. Their data were collected when coyote populations were presumably suppressed by widespread use of predacides, and he notes that at the time (1968-73), "[c]oyote populations in most of the midcontinent area appear to be suppressed by man." The authors noted an inverse relationship between red fox and coyote populations and speculated that "...protection of coyotes will result in expansion of local or regional populations that in turn will cause reductions in fox populations." They inferred that this will reduce predation on upland nesting ducks. Sargeant et al. (1987) reported on spatial relationships between coyotes and red foxes and showed that home ranges of fox families did not overlap the core centers of coyote home ranges on a North Dakota study site. Although none of their radio collared foxes were killed by coyotes in their study, they hypothesized that red foxes tended to avoid coyote territories, presumably because of the fear of being killed by coyotes. Thus, they inferred that a red fox population would increase if the coyote population is reduced, because the removal of territorial coyotes would create vacant coyote territories that could then become occupied by red foxes.

However, the presence of coyotes does not completely displace red foxes. Voigt and Earle (1983) verified that red fox

travel through coyote areas during dispersal, but did not establish there. They also reported that "...individual foxes and coyotes can occur in close proximity to each other along territory borders and when coyotes travel into fox areas." They also noted that "fox-coyote range overlap near borders was similar to fox-fox range overlap near borders and that coyotes do not "completely displace foxes over areas." Gese et al. (1996) reported that coyotes tolerated red foxes when

encountered about half of the time in Yellowstone National Park, although they also at times were aggressive toward and would sometimes kill foxes.

Also, there are other studies that suggest covote territories would not remain vacant for very long after the coyotes are removed. Gese (1998) noted that adjacent coyote packs adjusted territorial boundaries following social disruption in a neighboring pack, thus allowing for complete occupancy of the area despite removal of breeding coyotes. Blejwas et al. (2002) noted that a replacement pair of coyotes occupied a territory in approximately 43 days following the removal of the territorial pair. Williams et al. (2003) noted that temporal genetic variation in coyote populations experiencing high turnover (due to control) indicated that "...localized removal did not negatively impact population size..."



negatively
When we

Figure 4. Colorado mule deer and elk population trends from 1975 to 2003

(B. Watkins, Big Game Coordinator, CDOW, *unpubl. data* 2005).

consider the level of coyote removals that WS PDM activities achieve during PDM actions (only 2-4% of the estimated population - see section 4.1.1.1), it is most likely that coyote populations are probably not impacted enough, even at the individual territorial level, to create the vacant territories that would theoretically allow red fox populations to increase substantially at the local level based on the North Dakota studies discussed above. Therefore, we believe it would be unlikely for WS's coyote removal actions to lead to indirect increases in predation effects on grouse populations.

Mammals

Deer. Krausman et al. (1986) reported that fixed-wing overflights by Cessna 172 and 182 model small aircraft ≥ 100 feet above ground level (AGL) did not generally disturb desert mule deer in Arizona (Krausman et al. 1986). They observed that only 3 of 70 observed responses of mule deer to the overflights at 150 to 500 feet AGL resulted in the deer changing habitats. The few that did change habitats did so on the first overflight experience, but then did not change habitats on subsequent overflight exposure. They believed that the deer may have been accustomed to overflights because the study area was near an interstate highway that was frequently followed by aircraft. The aircraft they evaluated are larger and noisier than the J3 Supercub and Huskey airplanes used in most WS aerial hunting. For example, at level flight 500 feet directly overhead the 182 Cessna generates noise levels of 73.8 cdBA while the J3 Supercub (Piper PA-18) has a comparable noise level of 65 cdBA^{8 9}. Therefore, we would assume the airplanes used in aerial hunting would be even less disturbing to mule deer than the aircraft used in the above study that concluded

data obtained at http://www.faa.gov/about/office-org/headquarters-offices/aep/noise-levels/; "A-weighted decibels" are a standard measure used to compare noise levels of aircraft; FAA has published data on noise levels of various aircraft measured directly beneath the aircraft flying overhead at 500 feet above ground level for small propeller driven airplanes; cdBA is "corrected" "A-weighted" decibels. (Tom Connor, FAA, pers. comm. 2005).

A noise level of 65 dBA is described by the FAA as "comparable to normal conversation at 5' in a commercial area." Info. obtained at: http://www.awp.faa.gov/atenviro/CRITERIA.htm.

minimal disturbance. VerCauteren and Hygnstrom (2002) noted in a study that included aerial censuses of deer that deer typically just stood up from their beds, but did not flush, when the aircraft passed overhead. In addition, WS aerial hunting personnel frequently observe deer and antelope standing apparently undisturbed beneath or just off to one side of WS aircraft.

One particular concern with overflights is the potential to affect mule deer on their winter range during winter months in years when conditions such as heavy snow and poor forage availability have already stressed the deer to the point that heavy "winter kill" losses are likely. WS has conducted aerial hunting to protect sheep in several known areas of deer winter range, particularly in the Little Snake and White River BLM RAS.

Mule deer populations on a statewide basis have been relatively stable for many years and are currently estimated to be about 600,000 (Figure 4). The Statewide population increased from between 300,000 and 400,000 in the mid-1970s to a high of about 625,000 in the early 1980s, and has fluctuated between 500,000 and 600,000 from the early 1980s to present (B. Watkins, Big Game Coordinator, CDOW, *unpubl. data* 2005). In the part of the State where WS conducts a majority of its aerial hunting activity on federal public lands - northwest Colorado - mule deer herds are above the long term population objectives of the CDOW in 7 out of 11 Data Analysis Units (DAUs) (Table 8).

Table 8. Mule deer population long term objectives (LTO) for DAUs in northwestern Colorado, post-hunt population estimates for 2003 and 2004, and projection for 2005 (B. Watkins, Big Game Coordinator, CDOW, *unpubl. data* 2005), and WS aerial hunting hours on deer winter range areas.

			Post Hunt Population					10urs	nerial hu on BLM ge in D	l winter	"aerial hunted" plus	
DAU*	GMUs** in DAU	LTO	2003 (estimated)	2004 (estimated)	2005 (projected)	% above or below LTO	trend for last 3 yrs.	FY02	FY03	FY04	upward 3 yr trend in DAUs managed for increase?	
1	1,2,201	13,500	2,500	2,260	2,740	-79.70%	9.60%	8.5	2.5	10.1	yes	
2	3,301,4,441,5,14,2 14	37,800	43,970	47,490	46,840	23.92%	6.53%	10.9	3.0	9.3	NA (managed for decrease)	
3	6,16,161,17,171	6,000	6,050	7,770	7,120	18.67%	17.69%	-	-	-	NA (managed for decrease)	
6	10	7,000	8,170	7,870	7,510	7.29%	-8.08%	9.7	4.9	3.3	NA (managed for decrease)	
7	11,211,12,13,131, 231,22,23,24	67,500	102,510	93,670	91,980	36.27%	-10.27%	18.6	21.3	17.4	NA (managed for decrease)	
8	15,35,36,45	21,000	22,160	22,040	24,500	16.67%	10.56%	3.8	4.2	4.7	NA (managed for decrease)	
9	18,181,27,28,37,3 71	10,500	13,240	13,250	11,270	7.33%	-14.88%	-	-	-	NA (managed for decrease)	
11	21,30	20,000	10,140	8,770	9,640	-51.80%	-4.93%	-	5.3	0.7	no	
41	31,32	16,500	11,050	11,720	12,350	-25.15%	11.76%	-	-	-	NA (not flown)	
42	33	8,400	8,500	8,690	8,200	-2.38%	-3.53%	-	-	-	NA (not flown)	
43	25,26,34	8,100	8,740	8,770	10,130	25.06%	15.90%	-	-		NA (not flown)	
	TOTAL for NW Colorado	216,300	237,030	232,300	232,280	7.39%		51.5	41.2	45.5	42 3	

^{*}DAU = CDOW "Data Analysis Unit"

The combined statistics for the 11 DAUs in northwestern Colorado indicate the overall population exceeds the overall population objective by an average of more than 7% and has been relatively stable for the past several years. On average, mule deer populations in northwest Colorado have been increasing for a number of years (B. Watkins, CDOW, pers. comm. 2005; D. Finley, CDOW, pers. comm. 2005). CDOW regulates hunter harvest in attempts to bring the population in DAUs toward their long-term objective. Thus, a declining 3 year trend for 2003 to 2005 would be consistent with

^{**}GMU = CDOW Game Management Units (for a GMU map go to http://wildlife.state.co.us/hunt/gmumaps.asp)

objectives for DAUs where the population is greater than the long term objective. For the DAUs that are below their long term objectives (DAUs 1, 11, 41, and 42), the 3 year trend is slightly upward in 2 of them (DAUs 1 and 41) and downward in the other 2 (DAUs 11 and 42). However, 2005 projected deer numbers in each of those DAUs are only 5% and 2.4% below 2003 estimates, which means they have not been declining at any substantial rate. We looked at the DAUs with populations that were under their long-term objectives and were thus being managed towards increasing their populations and found no relationship with the recent short term population trend and whether they were aerial hunted (Table 8). Therefore, we find no evidence to suggest aerial hunting overflights contributed in some way to declining deer numbers. In areas where herds have declined or remain substantially below CDOW's herd objectives, drought, which results in poor forage availability for pregnant does and subsequent poor survival of fawns, is believed to be the major factor responsible (D. Finley, CDOW, pers. comm. 2005).

The potential for adverse effects on wintering deer particularly during severe winter conditions is minimized by the fact that WS's aerial hunting pilots are instructed during training to take care to avoid concentrations of deer and other readily visible nontarget wildlife (L. Burraston, National Aviation Manager, WS, pers. comm. 2005). Also, removal of coyotes during winter may benefit wintering mule deer herds to some extent. Coyotes are documented to cause substantial direct mortality of wintering deer. For example, Mackie et al. (1976) documented high winter losses of mule deer due to coyote predation in north-central Montana and stated that coyotes were the cause of most overwinter deer mortalities. Therefore, coyotes may cause additional stress on wintering deer not just from direct killing, but indirectly from chasing and pursuit. This source of stress is most likely reduced by the removal of coyotes through aerial hunting and other PDM activities during or prior to severe winter periods. Gese and Grothe (1995) found that territorial alpha (i.e., dominant breeding males and females) coyotes were more likely to be responsible for preying on or at least pursuing and attempting to prey upon wintering mule deer and elk. During winter, coyote populations are at or approaching their lowest numbers in their annual cycle (Knowlton et al. 1999), and it is at that time of year that they have the highest proportion of older-aged adults which are more likely to initiate pursuit of and attacks on wintering deer and elk than younger, less experienced coyotes (Gese and Grothe 1995; E. Gese, pers. comm. 2005). Removal of adult coyotes on winter range at that time of year would therefore be expected to result in at least some reduction in direct winter predation and indirect impacts (i.e., pursuit) on deer. Thus, it is likely that the relatively infrequent and brief aerial hunting activities that occur on deer winter range actually result in at least some level of net benefit to the deer populations allowing more deer to survive through severe winter periods.

CDOW expressed the opinion that aerial overflights on deer winter range during severe winter periods should not adversely impact deer if flights over deer are of short duration (B. Watkins, Big Game Coordinator, CDOW, pers. comm. 2005). WS's aerial hunting overflights in specific areas (e.g., BLM and USFS grazing allotments) are of short duration and low frequency (discussed further below). In conclusion, we find no evidence that WS aerial hunting overflights on deer winter range cause any substantive adverse impacts on deer populations, and it is probable that aerial hunting results in some level of net benefit to such populations.

Elk. Espmark and Langvatn (1985) found that elk become habituated to noise. We could find no studies of the impacts of aerial overflights on elk. However, elk populations on a statewide basis have been increasing for many years (Figure 4). The Statewide population has increased from about 120,000 in the early 1970s to more than 270,000 today. In northwest Colorado, overall elk populations have been more than 60% above the long-term objective set by CDOW and harvest is being managed to reduce numbers (B. Watkins, Big Game Coordinator, CDOW, *unpubl. data* 2005). The projected population in that part of the State for 2005 is about 34% above the long-term objective for 2005. Therefore, no significant cumulative impacts on elk populations from aircraft overflights, or any other stressor, is apparent.

Bighorn sheep. Krausman and Hervert (1983) reported that, in 32 observations of the response of bighorn sheep to low-level flights by small fixed-wing aircraft, 60% resulted in no disturbance, 21% in "slight" disturbance, and 19% in "great" disturbance. Another study (Krausman et al. 1998) found that 14% of bighorn sheep had elevated heart rates that lasted up to 2 minutes after an F-16 flew over at an elevation of 400 feet, but it did not alter the behavior of the penned bighorns. Weisenberger et al. (1996) found that desert bighorn sheep and mule deer had elevated heart rates for 1 to 3 minutes and changed to alert behavior for up to 6 minutes following exposure to jet aircraft. Areas of bighorn sheep habitat are generally too rugged to be suitable for aerial hunting. Also, as stated previously, WS pilots are instructed

during training to watch for an avoid readily visible nontarget wildlife, including bighorn sheep. Therefore, WS aerial overflights present little or no potential to cause any effects on bighorn sheep.

Bison. Fancy (1982) reported that only 2 of 59 bison (*Bison bison*) groups showed any visible reaction to small fixed-wing aircraft flying at 200-500 feet AGL. Therefore, available evidence indicates bison herds would not be adversely affected by aerial hunting overflights that happen to occur in areas they inhabit.

Pronghorn (antelope). Krausman et al. (2004) found that Sonoran pronghorn (a T&E species in Arizona) were not adversely affected by military fighter jet training flights and other military activity on an area of frequent and intensive military flight training operations. They also reported that pronghorn and desert mule deer do not hear noise from military aircraft as well as humans do, which indicates a reason why they appear not to be disturbed as much as previously thought. Therefore, available scientific evidence indicates overflights do not cause any adverse effects on pronghorn populations. The statewide pronghorn population has been relatively stable since the early 1980s. In northwestern Colorado where WS conducts a majority of its aerial hunting activity, pronghorn numbers are at or above long-term objectives set by the CDOW in 3 DAUs (9, 21, and 34) and under the long-term objective but stable or increasing for the last 3 years (2003 through 2005-projected) in 2 DAUs (10 and 11) (B. Watkins, Big Game Coordinator, CDOW, *unpubl. data* 2005). Thus, there does not appear to be any serious concern about overflights effects on pronghorn populations. We are unaware of any studies that indicate coyotes can cause serious winter mortality of pronghorns, but removal of coyotes in winter might theoretically reduce fawn predation later on in the spring similar to the way it reduces lamb losses on lambing ranges (Wagner and Conover 1999). If so, then aerial hunting of coyotes may have a net benefit to maintaining pronghorn populations.

Wild Horses. Four wild horse areas are located on BLM lands in Colorado (Piceance Basin, Little Bookcliffs, Sandwash Basin, and Spring Creek). Concern is sometimes expressed that aircraft overflights could impact horses. We could not find studies conducted specifically on wild horse response to aircraft overflights. However, while wild horses have been reported to become alarmed at the sight and sound of helicopter activity, especially in areas where helicopters are predominately used by BLM during round-ups, the small fixed-wing aircraft that are used by WS have little noticeable effect on wild horses. Frequently, wild horses in the proximity of a hunt area are seen to totally ignore fixed-wing aerial hunting activities, even to the point of not getting up from a reclining position (WS 1999c). We conclude that WS's aerial hunting activities likely have little effect on wild horses.

Domestic Animals and Small Mammals. A number of studies with laboratory animals (e.g., rodents [Borg 1979]) and domestic animals (e.g., sheep [Ames and Arehart 1972]) have shown that these animals can become habituated to noise. Long term lab studies of small mammals exposed intermittently to high levels of noise demonstrate no changes in longevity. The physiological "fight or flight" response, while marked, does not appear to have any long-term health consequences on small mammals (ANG 1997a). Small mammals habituate, albeit with difficulty, to sound levels greater than 100 dbA (i.e., A-weighted decibels) (USFS 1992). As shown below, the noise levels of the aircraft used by WS are low in comparison to other aircraft. Small mammals such as field rodents and rabbits have small home ranges and are generally widely distributed. The fact that WS only conducts aerial hunting on less than 5% of the land area of the State indicates that about 95% of small mammal populations are not even exposed to WS aerial hunting overflights. Further lessening the potential for any significant adverse impacts is that such flights occur only a few days per year. Regarding potential effects on livestock, the only persons likely to have concerns are livestock owners or managers. However, they are the ones requesting PDM assistance in most cases and are therefore more concerned about stopping or preventing predation on their livestock. WS stays at least 500 feet from livestock when aerial hunting which is effective in avoiding livestock disturbance for the most part based on personal observations of WS aerial crews.

Conclusion of Aircraft Overflight Impacts to Birds and Mammals

The above studies indicate that most bird and mammal species are relatively tolerant of aircraft overflights, even those that involve noise at high decibels such as from military aircraft. It appears that some species will frequently or, at least occasionally, show what appear to be adverse responses to even minor overflight occurrences. In general, the greatest

potential for impacts to occur would be expected to exist when overflights are frequent such as hourly and over many days which could represent "chronic" exposure. Chronic exposure situations generally involve areas near commercial airports and military flight training facilities. Even then, many wildlife species become habituated to frequent overflights which appears to naturally mitigate for adverse effects on their populations in local areas where such flights occur on a regular basis (as discussed above). WS aerial hunting operations occur in relatively remote rangeland areas and not near commercial airports or military flight training facilities. In addition, WS conducts very few flights over any one area in any one year as shown by the data in Tables 10 and 11 further below. Therefore, WS aerial overflights have little potential to reach a level that could be viewed as "chronic" in any local area.

2.3.2.2 Relative Noise Levels of WS Airplanes Used in Aerial Hunting. WS uses small fixed-wing aircraft and, on occasion, small helicopters for aerial hunting. Helicopters have been used very infrequently in recent years due to their increasing costs and much greater cost of operation than fixed-wing aircraft - less than 2% of WS aerial hunting hours in Colorado have been with helicopters over the past 5 years. The fixed-wing aircraft used by WS are relatively quiet whereas helicopters are somewhat noisier. As stated previously herein, the noise level of the J3 Supercub (Piper PA-18), which is not as quiet in operation as the Husky airplane model also used by WS (L. Burraston, WS National Aviation Manager, pers. comm. 2005), is reported by FAA to be 65 dBA when measured directly underneath the airplane flying at 500 feet AGL¹⁰. Put in perspective, that noise level is similar to "normal conversation at 5 feet" (in a commercial area)¹¹. In comparison, most military jet aircraft noise levels at 500 feet AGL range from 97 to 125 dB at various power settings and speeds (U.S. Coast Guard 1999). To experience the same level of noise by common military aircraft as one would experience directly beneath a flying J3 Supercub, a listener would have to be nearly 2 miles away from an F-16 and more than 3.7 miles away from the B-1B flying at 200 to 1000 feet AGL (from data presented in ANG 1997a, Appendix I). The effects on wildlife from these and other similar types of military aircraft have been studied extensively as shown in the information presented in this section and in ANG (1997a, 1997b) incorporated by reference herein, and were found to have no expected adverse effects on wildlife. Therefore, it is logical to conclude that the aircraft used in aerial hunting should have far less potential to cause any adverse disturbance effects on wildlife than military aircraft because the military aircraft produce much louder noise and are flown over certain training areas as many as 2,500 times per year, and yet were found to have no expected adverse effects on wildlife (ANG 1997a, 1997b). Further lessening the potential for effect from WS aerial hunting flights is that they occur on a small percentage of the land area of the State and of federal public land grazing allotments (about 2% of BLM and USFS allotments), and individual grazing allotments that are aerial hunted are exposed to relatively small numbers of overflights in any one year - an average of only 3% of the BLM allotments that were flown and none of the USFS allotments flown during FY 02-04 were exposed to more than 10 flights per year.

2.3.2.3 Potential for Effects on Wildlife from Gunshot Noise. Some commentors have expressed concern that gunfire noise during WS aerial hunting overflights might result in significant disturbance impacts on wildlife species. The time spent shooting at coyotes from aircraft during aerial hunting flights is actually an exceedingly small proportion of overflight times. WS aerial hunting data for Colorado show an average of 3 coyotes killed per hour of aerial hunting. A typical "pass" in which shots are taken at a coyote takes only a few seconds and usually involves 2 to 3 shots with a 12 gauge shotgun. It generally takes an average of just more than 1 pass to successfully shoot and kill a coyote (because most are killed on the first pass). It is estimated that on average no more than about 30-45 seconds of every hour spent flying are involved in making passes and shooting (L. Burraston, National Aviation Manager, WS, pers. comm. 2005) which means that only about 1-2% of the time spent aerial hunting is actually spent in shooting at target animals and generating gunshot noises.

A few studies have indicated gunshot noise can alter behavior of some wildlife species, including waterfowl (Meltofte 1982) and eagles (Stalmaster and Newman 1978). It has been suggested that firearms noise affects species that are

Information obtained from FAA website @ http://www.faa.gov/about/office org/headquarters offices/AEP/noise levels/media/uscert appendix 07.xls

FAA "Criteria for Evaluation of Aviation Generated Noise" website @ http://www.awp.faa.gov/atenviro/CRITERIA.htm

hunted due to their association of such noise with being pursued and shot at by humans (Larkin 1996). As part of the existing human environment (i.e., "environmental status quo"), about 450,000 persons participate in hunting in Colorado and kill about 100,000 big game animals and more than 850,000 small game animals each year (USFWS 1996b; CDOW 2005c). WS aerial hunting accounts for an average of 2,100 animals shot per year in Colorado. At an average of 4 shots per animal killed, the number of shots fired in a year during aerial hunting is less than 10,000. The number of shots fired by private hunters each year would, at a highly conservative estimate of 2 shots fired per animal killed, would be nearly 2 million. Therefore, WS's contribution to overall gunshot noise in areas of wildlife habitat is less than 0.6% of the number of shots fired at wild animals in the State each year. Therefore, WS adds only exceedingly small amounts of gunshot noise to that which occurs annually as part of the existing human environment in wildlife habitat areas of Colorado.

Gunshot noise from WS aerial hunting activities probably has no discernable or at most only minor potential to adversely affect wildlife populations because of the small frequency and duration of WS aerial hunting flights and the small proportion of geographic area involved (4% of the land area of the State, 11% of BLM grazing allotment acreage, and less than 2% of USFS land area) which means only small proportions of nontarget wildlife populations would ever hear any noise from WS gunshots. Also, shooting from aircraft is virtually always at an extreme downward angle towards the ground. Pater (1981 cited in Larkin 1996) reported that muzzle blast is louder in the direction toward which the weapon is pointed by up to 14 decibels. Thus shooting downward toward the ground would serve to lessen the noise in lateral directions from the aircraft. WS personnel on the ground observing aerial hunting training passes in which shots are taken report that the gunshot noise heard at a distance of 150 yards or more is more like a "pop" noise rather than the sound of an explosion (L. Burraston, National Aviation Manager, WS, pers. comm. 2005). This indicates shotgun noise from the airplane is not loud enough to cause much of a startling or disturbance effect at a distance. Animals that happen to be directly beneath or in close proximity to the airplane when shooting passes are made will undoubtedly hear the firearm noise as much louder, but the low frequency of occurrence of flights and small fraction of aerial hunting time actually spent firing the shotgun, along with the very small proportion of the geographic area over which shooting passes are made suggests only very small proportions of wildlife populations would be exposed to any close-proximity shotgun firing noise.

If gunshot noise caused serious adverse effects on wildlife populations, we believe the USFS, BLM, and State wildlife agencies would have addressed and mitigated such effects from the hundreds of thousands of private hunters that are allowed to hunt and shoot at game and certain nongame animals on federal public lands and elsewhere. The fact that mule deer and elk populations have been stable or increasing in northwest Colorado where WS conducts most of its aerial hunting activities (B. Watkins, Big Game Coordinator, CDOW, pers. comm. 2005; see data analysis above) indicates there have been no consequential cumulative disturbance effects on big game species.

2.3.2.4 Areas Exposed to WS Aerial Hunting. From FY00 to FY04, WS flew an average of 801 hours annually (13 hours of helicopter and 788 hours of fixed-wing airplane) over about 4,500 mi² of properties that were under WS agreements in Colorado or about 4% of the land area of the State. Thus, WS aerial hunting activity is minor in terms of geographic scope because 96% of the land area in the State is not exposed to any such activity. Of the hours flown in that 5 year period, 71% occurred over private lands, 22% over BLM lands, 5% over USFS lands, and 2% over other lands (primarily State owned lands). The average amount of time spent flying over the properties that were aerially hunted amounted to an average of 13 minutes per mi² of such properties in a year. Therefore, on the small proportion of the landscape exposed to aerial hunting only a tiny fraction of the time in an entire year is generally exposed to aerial hunting overflights.

Table 9 shows data on aerial hunting hours for the counties in which aerial hunting occurred for the past 3 years. WS aerial hunts more in northwest Colorado than in any other portion of the State due to its higher numbers of domestic sheep which tend to need more protection from coyote predation than other types of livestock. About 45%, 20%, and 11% (total of 76%) of WS aerial hunting hours occurred in Moffat, Rio Blanco, and Routt Counties, respectively, during the last 3 years (FY 02-04). Lesser amounts occurred in several counties in west-central (Mesa, Delta, Garfield, Montrose, Eagle, Gunnison, San Miguel, Ouray Counties), south-central (Alamosa, Rio Grande, Costilla Counties), and eastern (Crowley, Otero, Las Animas, Baca, Lincoln, Elbert, Adams, Weld Counties) portions of Colorado.

The land area of properties flown in the 3 most aerial hunted counties was: 26-28% of the total area of Moffat County; 8-11% of Rio Blanco County; and 5 -10% of Routt County. Therefore, even in the counties of Colorado with the majority of WS aerial hunting activities, 75% to more than 90% of the land area of those counties is not exposed to any WS aerial hunting in a typical year.

Table 9. WS and other aerial hunting hours for FY02 to FY04 in Colorado counties where aerial hunting occurred. "Other" aerial hunting data came from CDA aerial hunting reports in their files (the actual number of "other" hours flown were not available from CDA reports, but estimated based on an assumption that private aerial hunters had a success rate ½ of the average multi-year success rate of the APHIS-WS program (3.0 coyotes per hour flown), to err on the side of

overstating potential overflights impacts).

		WS Aei	rial Huntii	ng Hrs.		Other Aerial Hunting Hrs. (est.)				Cumulative Total				
County	FY02	FY03	FY04	Ave.	% of Total	FY02	FY03	FY04	Ave.	FY02	FY03	FY04	Ave.	
Moffat	399.0	291.0	335.0	341.7	44.5%	0.0	4.5	9.5	4.7	399.0	296.0	345.0	346.0	
Rio Blanco	201.0	115.0	134.0	149.9	19.5%	0.0	4.5	9.5	4.7	201.0	120.0	144.0	155.0	
Routt	126.0	49.4	78.4	84.5	11.0%	-	-	-	-	126.0	49.4	78.4	84.5	
Montrose	46.8	31.0	42.9	40.2	5.2%	-	-	-	-	46.8	31.0	42.9	40.2	
Otero	35.2	38.4	20.6	31.4	4.1%	-	•	-	-	35.2	38.4	20.6	31.4	
Bent	28.6	15.4	33.5	25.8	3.4%	-		•	-	28.6	15.4	33.5	25.8	
Eagle	14.3	24.7	24.9	21.3	2.8%	-		-		14.3	24.7	24.9	21.3	
Crowley	31.5	11.4	7.0	16.6	2.2%	-	-	-		31.5	11.4	7.0	16.6	
Delta	3.3	11.1	16.6	10.3	1.3%	•	-	-	-	3.3	11.1	16.6	10.3	
Gunnison	6.0	10.8	7.7	8.2	1.1%	-	-		-	6.0	10.8	7.7	8.2	
Mesa	0.0	8.0	9.0	5.7	0.7%	-	-	-	-	0.0	8.0	9.0	5.7	
Alamosa	10.3	6.5	0.0	5.6.	0.7%	-	-	-		10.3	6.5	0.0	5.6	
Lincoln	8.0	1.4	1.0	3.5	0.5%	7.0	0.0	0.0	2.3	15.0	1.4	1.0	5.8	
Adams	0.0	0.0	10.0	3.3	0.4%	_	-	-	-	0.0	0.0	10.0	3.3	
Elbert	0.0	0.0	9.8	3.3	0.4%	-	-	-	-	0.0	0.0	9.8	3.3	
Las Animas	9.5	0.0	0.0	3.2	0.4%	-	-	-	-	9.5	0.0	0.0	3.2	
Weld	0.0	0.0	9.0	3.0	0.4%	-	-	-		0.0	0.0	9.0	3.0	
San Miguel	3.0	3.1	1.0	2.4	0.3%	-	-	-	-	3.0	3.1	1.0	2.4	
Costilla	5.3	0.0	0.0	1.8	0.2%	-		-		5.3	0.0	0.0	1.8	
Ouray	1.5	1.7	0.5	1.2	0.2%	-	-	-		1.5	1.7	0.5	1.2	
Baca	0.0	3.4	0.0	1.1	0.1%	-		-	-	0.0	3.4	0.0	1.1	
Garfield	0.0	0.0	2.6	0.9	0.1%	-		-	-	0.0	0.0	2.6	0.9	
Grand	0.0	2.0	0.0	0.7	0.1%	-	-	-	-	0.0	2.0	0.0	0.7	
Rio Grande	0.0	1.7	0.0	0.6	0.1%	-	-	-	-	0.0	1.7	0.0	0.6	
Γotal	929	627	744	767	100%	7	9	19	12	936	636	763	778	

WS Aerial Hunting on Federal Public Lands

Aerial Hunting Flights on BLM Lands. WS aerial hunted on an average of only 1.9%, or 44, of the 2,339 BLM grazing allotments in the State per year for the past 3 years (FY 02-04) (Table 10). The land area of BLM grazing allotments exposed to WS aerial hunting totaled an average of 1.1 million acres, or 1,650 mi² during FY 02-04, which is 10.2% of the total area of BLM grazing allotments¹² of the State. Therefore, in terms of acreage, almost 90% of the BLM grazing allotment land area in the State is not exposed to any WS aerial hunting operations on average in any one year. Of the 44 allotments hunted, nearly 2/3, or 27, were exposed to only 3 or fewer flights per year; 14 allotments were exposed to 4-9 flights per year, and only 3 (0.1% of total allotments), were exposed to more than 10, with none exposed

Total area of BLM grazing allotments in the state was estimated at 10,818,387 acres as of the time of this writing based on data obtained from the BLM Colorado State Office. However, these designated "allotments" include some acreage in Utah along the CO-UT border and non-BLM land that is intermingled with BLM administered land. We were unable to separate out those types of acreage from the individual allotment acreage data we received from BLM. Total BLM administered land (surface acres) within the borders of Colorado is 8,331,848 acres.

to more than 17, flights in any one entire year.

Table 10. WS aerial hunting time and days flown on grazing allotments in Colorado BLM RAS from FY02 to FY04. The acreage, number of allotments flown, total days flown in the entire RA, and combined totals for BLM are also given.

The acreage, number	r of allotments flown, total d							.M are al	so give
	WS Aerial Hunting Time on I	BLM Grazin	g Allotment	s in Colora	ido during	FY02-FY)4		
BLM Resource Area (RA)	Allotment Name	Aliot ID #	Acres	Aerial	Hunting F Allotmen		#	Days Flo	wn
		Allot. Count FY02- FY04		. FY02	FY03	FY04	FY02	FY03	FY04
Glenwood	East Castle*	08601	9,480	2.7	2.2		4	2	
	State Bridge	08706	5,903	3.1	7.5	4.7	4	6	2
	Bocco Mtn	08730	3.967	2.4		l	2		
Glenwood RA Subtotal		3	19,350	8.2	9.7	4.7	10	- 8	2
# Allot, Flown&Flight D	ays Glenwood RA/yr			3	2	. 1	4 days	7 days	2 days
Grand Junction	Little Salt	16507	33,718		2.7			2	
	East Salt Creek*	16602	102,060		2.6			2	
Grand Jet RA Subtotal		2	135,778	0.0	5.3	0.0	-0	- 4	0
# Allot. Flown&Flight D	ays Grand Jet RA/yr	1 m m 7		0	2	0	0	2 days	0
Gunnison	Sapinero Mesa	06101	12,169	1.0			1		
	Goose Creek	16001	3,133		0.5				
Gunnison RA Subtotal		2	15,302	1.5	0.5	0.0	2	0	0
Allot Flown&Flight D	ays Gunnison RA/yr			2	adus E	0	2 days	3 × 0	0
Little Snake	North Mud Spring	04051	7,937		1.3			1	141.111
	East Powder Wash	04202	26,779	2.3	0.9	6.4	4	i	10
	Snake River	04206	62,497	6.0	0.5	10.1	11′	i	12
	Upper Horse Gulch	04210	11.116	1.9	2.7		3	5	
	Powder Wash	04214	32,541	8.6	4,4	8.3	7	5	7
	State Line	04215	6,599	0.5			1		
	Sheepherder Spring	04217	75.742	20.8	1.1	14.3	13	1	7
	Sand Wash	04219	76,192	20.1		7.1	12		6
	Grounds	04222	7,997			0.3			1
	Red Wash	04224	21,966	7.0	0.3	3.5	7	l	6
	Nipple Peak	04225	15,566	1.3		1.0	4		1
	Hiawatha Tridistrict	04300	22.683	2.6		1.1	3		2
	Shell Creek	04301	7.984	3.7			4		
	Drv Creek	04302	85,140	0.4	4.9	8.9	1	2	. 3
	Cross Mtn*	04307	21.841		0.3	0.5		1	1
	Sawmill Canyon*	04308	21,999	4,3	1.9	1.9	6	2	2
	Browns Park	04320	55,480	0.8			2		
	Canyon/Horseshoe	04326	12.531	3.7		2.0	2		
	Diamond Breaks	04327	37,026		3.2			2 `	
	Spitzie Draw	04335	21,529	3.6		<u> </u>	2		
	Disappointment Wasti Park	04400	32,327	5.0	3.2	1.9	2	8	2
	West Wapiti Peak	04401	11,209	6.5	0.7	0.7	10	2	-
	Cedar Springs Draw	04402	33,627	11.1	11.2	8.5	12	11	7
	Sagebrush Creek Crooked Wash	04403	23,405 18,861	0.3 5.0	0.4		6	1	
	Lav Peak	04404	1,833	J.V	0.9	0.2	<u> </u>	3	1
	North Decention Creek	04408	12,689		1.0	1.9		1	2
	Lower Maudlin Gulch	04416	15,237	2.7	1.0	1.7	3	,	
	Lower Boxelder Gulch	04431	13.650	ا . ش	0.5	2.2		1	3
	Duffy Mtn	04431	9,837	1.3		11	2	,	3
	Upper Four Mile	04500	4,768	A red		0.4			• 1
	Greasewood	04521	46,301	6.5	3.8	13.4	6	4	15_

J	es Mtn	04603	10,577	L	<u> </u>	0.5	<u> </u>		1
Little Snake RA Subtotal		33	865.461	126.0	43.2	95.5	124	53	94
# Allot. Flown&Flight Days I	Little Snake RA/yr			24	19	22	54 days	28 days	49 days
Uncompahgre Basin U	pper Peach Vallev*	05007	4,102	0.3	2.1	2.3	1	3	3
Br	rush Point*	05008	18.829	0.7	0.3		1	1	
Bi	ig Gulch40*	05036	295	0.8	0.5	0.8	2	1	2
Sa	ındv Wash	05502	7.458	1.6		0.5	1		1
	ower Escalante	14002	2,549		1.0			2	
W	ells Gulch	14016	17.046		1.0			2	
De	eer Basin/Midway*	14019	12,403		1.5	1.2		2	2
Sc	outh of Town	14534	8,116	<u> </u>		1.6			3
Uncompangre RA Subtotal		8	70,798	3.4	6.4	6.4	4	. 6	5
# Allot. Flown&Flight Days I	Uncompahere RA/yr			4	- 6	5	4 days	6 days	9 days
White River Bo	oise Creek	06042	8.356	5.8	11.8	4.6	4	7	4
Cr	ricket (VFO)	06300	2,765		0.5			1	
Ro	oundtop	06302	9,588		1.3			3	
<u>M</u>	ud Springs Draw	06303	2,576		0.3			1	
	asin Springs	06304	12,641		1.3			3	
M	arthas Hole	06305	4,857		1.2			3	
Tu	ırner Creek	06306	4.354		0.8			2	
K	Ranch*	06307	62,586		2.2			4	
Ar	tesia*	06308	49,409	0.5	4.0	. 8.5		4	6
Sta	ate Line (VFO)	06311	8,097	8,5		5.4	6		3
Ra	aven Park	06314	19,986		0.5	3.8		. 1	4
Sp	ooky Mtn	06316	29,688	7.4	3.6		6	5	
Re	ed Wash	06320	8,239	5.4	2.0		4	4	
W	olf Creek*	06323	80,023		3.8			5	
Sk	ull Creek*	06322	14,290	1.1			2		
Ma	assadona	06324	10,890	1.0	2.0		1	6	
EI	k Springs	06326	26,761	0.3			1		
<u>w</u>	inter Valley Gulch	06329	1,887	7.3			7 '		
Hc	orse Draw	06332	17,982	2.9	0.6	1.9	3	-1	2
Co	pal Reef	06334	4,008			0.5			2
Jol	hnson/Trujillo	06338	19,412			1.3			1
Ba	ınta Flats	06343	16.065	9.8	3.7	9.7	5 -	2	.5
Re	d Rocks	06371	2,459		0.6			2	
Lit	ttle Toms Draw	06603	14.355	25.7	12.1	4.5	17	7	3
	ack-footed Ferret*	#####	52,038	45.2	27.6	19.7	8	6	4
White River RA Subtotal		24	431,274	120.9	79.9	59.9	65	67	- 34
# Allot. Flown&Flight Days White River RA/yr					19	10	24 days	20 days	12 days
BLM Active Total		4,274	1,564,741	260.0	145.0	166.5	205	138	135
Allot. Flown&Flight Days BL	M Lands/vr			46	49	38	88	63	72

^{*}The black-footed ferret reintroduction area includes several allotments, but is counted only as one for the purposes of this Table.

About half of East Castle allotment is in the Castle Peak Wilderness Study Area (WSA); a small percentage (<5%) of East Salt Creek is in Demarce WSA; about 1/4 each of Cross Mtn. and Sawmill Canyon allotments are in Cross Mountain and Vale of Tears WSAs; Upper Peach Valley, Brush Point, and Big Gulch 40 allotments are in the Gunnison Gorge National Conservation Area; the 30% of the K Ranch allotment is in each of the Willow Creek and Bull Canyon WSAs; about half of the Deer Basin/Midway allotment is in the Adobe Badlands WSA; most of the Skull Creek allotment and a small percentage (<5%) of both the Artesia and Wolf Creek allotments are in the Skull Creek WSA. WS did not aerial hunt in any of the WSA portions of these allotments during FY 2002-2004.

A total of 72 BLM allotments were aerial hunted from FY02 to FY04 with a maximum number of BLM allotments flown in a year = FY03 at 49 total allotments.

Since the most intensive WS aerial hunting overflights have occurred in the Little Snake and White River RAS, we focus further analysis on those areas in terms of evaluating the potential for adverse effects on wildlife on BLM lands. In the Little Snake RA, there are 364 grazing allotments managed by BLM. WS conducted aerial hunting on an average of 22 (range 19-24) or 6%, of these allotments per year. Therefore, about 94% of the allotments in the Little Snake RA were

not exposed to any aerial hunting by WS in a typical year. On a land area basis, the acreage of allotments flown per year ranged from 575,000 to about 750,000 which is 33% of the total acreage of grazing allotments in the Little Snake RA. Therefore, at least 2/3 of the land area of this RA is not exposed to any aerial hunting in a typical year (see section 1.1.2 where we discuss why it is likely that only about 1/5 of the area of individual defined properties, including federal land grazing allotments, is actually worked when WS conducts PDM actions).

Of the 22 allotments on the Little Snake RA aerial hunted on average by WS in a year, 13 were exposed to no more than 3 flights per year. An average of 3 were exposed to more than 9 flights in an entire year, with no allotment being exposed to more than 15 flights in any year. This shows the frequency of such flights has been low in any one year – even on the most frequently aerially hunted allotments, WS aerial hunting occurred on less than 5% of the days of the year.

On the White River RA, there are 153 grazing allotments managed by BLM. WS conducted aerial hunting on an average of 14 (range 10-19) of these allotments per year. This means more than 85% of the allotments in the White River RA are not exposed to any WS aerial hunting in a typical year. On a land area basis, the acreage of allotments flown per year ranged from 210,000 to about 410,000 which is 20% of the total acreage of grazing allotments in the White River RA. Therefore, less than 80% of the land area of this RA is not exposed to any aerial hunting in a typical year (again, see section 1.1.2 where we discuss why it is likely that only about 1/5 of the area of individual defined properties, including federal land grazing allotments, is actually worked when WS conducts PDM actions).

Of the 14 average allotments flown on the White River RA by WS in a year, 7 were exposed to no more than 3 flights per year. Less than 1 allotment, on average, was exposed to more than 9 flights in an entire year. The greatest number of flights occurring on one allotment was 17. This shows the frequency of such flights on BLM allotments has been low in any one year — even on the most frequently aerially hunted allotments, WS aerial hunting occurred on less than 5% of the days of the year.

On a per unit area basis, the amount of time that aerial hunting occurred over the course of a year on individual BLM allotments averaged only 0.2 to 9.5 minutes/mi.². This suggests overflight exposure on the BLM areas flown was only a tiny fraction of the time in a year.

Aerial Hunting Flights on USFS Lands. Table 11 shows WS aerial hunting activity on USFS National Forests and Grasslands in the State. WS aerial hunted on an average of 27 (range 18 to 32) USFS grazing allotments per year in FY02-FY04, which was only 2.1% (range 2.1 to 2.5%) of the 2,155 total USFS grazing allotments in the State. Therefore, more than 97% of USFS grazing allotments are not exposed to any WS aerial hunting in the average year. On a land area basis, the total acreage of USFS allotments flown ranged from about 106,000 to 186,000 acres per year. The higher acreage constitutes less than 2% of the 10.9 million acres of USFS grazing allotments in Colorado. Thus, more than 98% of the grazing allotment area is not exposed to any WS aerial hunting in a typical year.

Table 11. WS aerial hunting time and days flown on USFS grazing allotments, by Ranger District and National Forest, in Colorado during FY02 to FY04. The acreage, number of allotments flown, total days flown in the entire RD and combined totals for USFS lands are also given.

	WS Aer	ial Huntin	g Time on I	USFS Graz	ing Allotm	ents in Col	orado durii	ig FY02-F	Y04		
Ranger District	~ 11		Allot Acres		Aerial Hunting Hours on Allotment			Flight Days Over Allotment			Ave. min/mi²
				FY02	FY03	FY04	yr	FY02	FY03	FY04	per flight day
		Grand Me	sa, Uncom	pahgre, an	d Gunnisor	National I	orest Allot	ments			
Paonia	Huntsman	00871	20,486	0.8			0	l			1
GMNF/UN	IF/GNF Total	1	20,486	0.8	0.0	0.0	0	1	0	0	1
# Allot. Fle	wn&Flight Days GMNF/I	JNF/GNF	/уг	1	- 0	0	0 ::-	1 day	0	-0	- 0
	Pike ar	nd San Isa	bel Nationa	l Forests a	nd Comanc	he Nationa	l Grassland	ls Allotmer	nts		
Comanche	3D Holt Park	06532	2,577		0.3				1		-, 4
	Valley View	06715	15,313	1.0		<u></u>	1	11	<u> </u>		<u> </u>

	Timpas	06716	7.761	2.9	l		5	5	I		3
PNF/SINF/	CNG Total	- 3	25,651	3.9	0.3	0.0	2	- 6	1	0	1
# Allot. Flo	wn&Flight Days PNF/SIN	IF/CNG/y	r	2	1.2	0	1	6 days	1 day	0	2
			Ro	outt Nation	al Forest A	llotments				3 111 November 200	A CONTRACTOR OF THE PARTY OF TH
Yampa	Baldy Mountain*	01518	6.950	0.4]	1	l i	<u> </u>	1	2
1	Dunckley Flattops	01525	3,954	0.7		0.5	4	2		1	4
	East Fork	01526	2,637	0.7		0.5	6	1		i	9
	Knife Edge	01527	4,932	2.1			5	4			4
	Ute	01535	4,154			0.2	1			1	2
	Willow Creek	01537	4,104	2.2			7	3			. 7
	Indian Run	01549	3,821	1.0			3	3			3
	Beaver Creek	01550	5,692	1.3			3	2	-		4
	Beaver Flattops	01551	1,560	3.1			25	5			15
Hahns	Adams	03102	2,067			0.5	3			2	5
Peak	Meaden Peak	03103	3,904			0.3				11	3
Bears Ears	- State Hitothittin	03104	4,631			0.4	1			2	2
	California Park	03105	3,735			0.8	3			1	- 8
	Stewardship	03110	12.802	1.6	1.0	2.9	55	3	1	. 5	2
	Lost Park	.03111	7,640			0.4	1			2	1
	Sawtooth	03112	4,720	1.7			5	3			5
	Little Bear	03118	10,474		1.1	0.4	2		1	11	3
	Bears Ears	03119	2,695	0.5			2	2			4
	Mill Creek	03120	2.809	0.8	4.9	0.5		3	5	4	<u> </u>
	North Fork Elkhead	03121	3.114		0.0	0.3	1				4
	Slide Mountain	03122	3,404	2.8	0.3	0.8	15	9	1	2	4
	Baldy Peak	03123	3,181	3.4	1.7	1.1	25	10	2	3	5
	Hole in the Wall	03124	3,466	1.3	1,3	1.6	16	6	2	4	4
	Potholes	03125	1,971	0.6		0.7	<u>8</u> 8	2		3 4	5 4
	West Ouaker Johnson Creek	03126	3,985 4,415	0.8	0.3	2.7	14	3		4	5
		03350	9.289	1./	0.9	3.5	6		1 /	4	4
Routt NF T	Oliver Creek	= 27 = 1	126,106	26.7	1-1.5	19.9	6	65	14	46	()
			120,100		8	19				14 days	13
# Allow Flo	wn&Flight Days Routt NF	7уг.	73.71	18	All 10 10 10 10 10 10 10 10 10 10 10 10 10	COLUMN TERRETORY	15	18 days	7 days	14 days	13
					ional Fores	t Allotment					
Blanco	Lost Park/Moeller	00205	8.006	1.7		3.1	8	2		2	6
	Aldrich Lakes S&G	00214	3.084	1.7	2.5	1.0	22	2	2		13
	Clear Creek	00215	2,226	H	- 20	1.7	10			2.	15
	Three Points	00218	2,146	4.2	3.9		48	5	3		18
]]	Coal Creek	00219	8.096	4.2	4,4	17	14	5	5		17
	Deer Creek	00220 00223	3,794	7.0	2.7	11.0	36	3	1	4	13
	Flag Creek/Big Mtn	00223	7.407 8.361	7.0 2.0	1.3	11.0	5	2	 	4	5
]	Sleepy Cat/Corral	00226	7,317		2.8	1.0	13	4	3		5
	Milk Creek Morapos Creek	00229	4,262	2.0	2.0	1.0	6	3	J.		6
	Wilson Mesa	00232	4,202	2.0		1.0	3	٠ .		1	9
	Sawmill Mtn	00234	4,129	1.0	2.0	1.0	11	1	2	1	8
	Lantern Ridge	00234	6.383	0.7	1.2	2.0	8	1	2	2	5
	Upper Fawn	00237	6,049	3	7	2.0	20	3	6	-	7
M/hite Dive	r NF Total	14	75,924	30.9	27.3	23.5	14	31	25	15	1
	wn&Flight Days White Ri			11	9 - 9	9	1.0	15	11	10	12
							10		40	6l	0
USFS Color			248.167	62.3	39-1	43.4		103			
# Allot. Flo	wn&Flight Davs USFS Co	olo NFs&N	√G/vr	32	18	28	26	31 days	21 days	23 days	25

^{*} The Baldy Mountain allotment is almost entirely in the Flat Tops Wilderness Area. WS did not aerial hunt in this Wilderness Area during FY 2002-2004

A total of 45 USFS allotments were aerial hunted from FY02 to FY04 with a maximum number of USFS allotments flown in a year = FY02 at 32 total allotments.

Most (97%) of WS aerial hunting on USFS lands occurred in just two NFs - the Routt and White River in northwest Colorado. On the Routt NF, WS flew on an average of 15 (range 8 to 19) grazing allotments per year, which is about 11% of the 139 grazing allotments on the Routt NF. On a land area basis, the total acreage of allotments flown on the Routt NF ranged from about 50,000 to 92,000 per year. These acreages constitute 5.2% to 9.8% of the 935,782 acres of USFS grazing allotments on the Routt NF. Thus, more than 90% of the grazing allotment area on that NF is not exposed to any WS aerial hunting in a typical year.

On the White River NF, WS flew on an average of 10 (range 9 to 11) grazing allotments per year, which is about 7% of the 135 allotments on that NF. Therefore, more than 89% of allotments on the two forests are not exposed to any aerial hunting in a typical year. On a land area basis, the total acreage of allotments flown on the White River NF ranged from about 47,000 to 66,000 per year. These acreages constitute 3.2% to 4.5% of the 1462,365 acres of USFS grazing allotments on the White River NF. Thus, more than 95% of the grazing allotment area on that NF is not exposed to any WS aerial hunting in a typical year.

The only other NF grazing allotments in the State that were aerial hunted were on the Comanche National Grassland in the Pike/San Isabel NF (average of 1 and up to 2 allotments flown per year), and on the Grand Mesa, Uncompahgre, and Gunnison NF (1 allotment flown once in the 3 years). On the Pike/San Isabel NF, total acreage of allotments flown per year ranged from 0 to 26,000, which is 0 to 1.7% of the total acreage of grazing allotments on that NF. Total grazing allotment acres on the Comanche Ranger District (Comanche NG) is 413,616. Therefore, the acres flown ranged from 0 to 6.2% of that National Grassland area.

Of the 2-3% of the USFS allotments in the State that were aerial hunted, the number of flights in a given year ranged from 1 to 10. However, 75% of those allotments were exposed to fewer than 4 flights per year and only 1 of them had more than 9 flights in one year. This shows that the frequency of flights on individual allotments was low, i.e., they occurred on a very small fraction (less than 3%) of the 365 days in a year. The duration of individual flights on individual USFS allotments averaged between 0.6 to 13.5 minutes/mi.² in an entire year. Therefore, the amount of time each allotment was exposed to aerial hunting overflights on a per unit of land area was also low.

Conclusion for Aerial Hunting on BLM and USFS Lands. The above information shows that WS aerial hunting overflights on specific areas of BLM and USFS lands in Colorado have occurred on an infrequent basis and on a relatively small proportion of the total BLM and USFS land area of the State. Even within the specific BLM RAS and USFS NFs where WS conducts the most federal land aerial hunting activities, a majority of the land area is not exposed to aerial hunting flights, and the frequency and duration of WS overflights are relatively low, occurring on only a small fraction of the days of the year. Clearly, aerial hunting flights by WS on BLM and USFS lands in the State are minor in number and geographic scope and in no way could be considered to approach a level that could be interpreted as presenting "chronic" overflights exposures to wildlife on substantial areas of federal public land.

Again, considering the evidence presented earlier in Section 2.3.2.1 that wildlife generally are not adversely affected by overflights, and the further evidence discussed below (ANG 1997a, 1997b) indicating that even frequent overflights totaling more than several hundred per year by the military in specific areas do not cause adverse effects on wildlife populations, it is logical to conclude that the much more infrequent aerial hunting overflights by WS have little or no potential to result in adverse impacts on nontarget wildlife on BLM or USFS lands in the State. It is apparent that further site-specific analysis of the effects of WS aerial hunting overflights on wildlife is not necessary to a reasoned choice among alternatives in this EA process. This is because regardless of where such overflights occur, the best available information on this issue indicates adverse effects are not serious. Existing procedures in place to further lessen the potential for concern about impacts on wildlife populations or other resources and interests on federal public lands include work planning coordination with the BLM and USFS. It is during such coordination that the federal land managers and CDOW personnel are provided the opportunity to let WS personnel know about specific locations where mitigation or restrictions on WS PDM activities might be necessary to reduce or eliminate the potential for adverse effects on specific resources. That process is where new information and knowledge can be brought to our attention that might change our conclusions about the seriousness of actual or potential effects on wildlife resources from aerial hunting overflights. We rely on that process to assist in avoiding substantive adverse effects on relevant components of the

human environment.

2.3.2.5 Cumulative Impacts of Aircraft Overflights. Some public comments have raised the concern that WS aerial hunting overflights, when added to other types of low level overflights, might result in cumulative adverse effects on certain wildlife species populations.

Military Overflights

The Air National Guard finalized an EIS (ANG 1997a) on a proposal to expand military training flights in Colorado. That EIS contains considerable analysis on the potential for military training overflights by jet aircraft to adversely affect numerous wildlife species, and we refer readers to that document for a more thorough coverage of the detailed analysis. Further below, we identify those areas and counties within Colorado where military training flights occur. In summary, the analysis in that EIS established the following:

- Many studies exist that have documented behavioral responses in wildlife, but those studies have not provided evidence that wildlife species populations have been adversely affected to any substantial degree. ANG (1997a) concluded that their Preferred Alternative (the "Colorado Airspace Initiative"), which involved from 62 to 2,461 "sorties" (military training flights) on 14 separately identified airspace components per year, was not expected to result in any significant environmental impacts. In particular regarding effects on wildlife, ANG concluded that no adverse impacts were expected on any wildlife species in any of the airspace components where the training flights would occur.
- Aircraft overflights within 650 to 1640 feet have been shown to increase the heart rates and cortisol levels of large herbivores (USFS 1992). However, even when animals flee temporarily from approaching aircraft, available evidence suggests risks of damage are low as animals take care not to injure themselves when startled or frightened.
- Studies of wildlife subjected to aircraft overflights have not shown evidence of compromised reproduction, either directly or indirectly (USFS 1992).
- A majority of the literature reviewed led to the conclusion that numerous wildlife species have the ability to adapt to the presence of man and various man-made sound sources, including jet aircraft noise. Although initially startling, habituation to jet aircraft noise occurs with most wildlife species.
- No published scientific evidence was identified that indicated harm may occur to wildlife as a result of exposure
 to the levels of noise generated by military aircraft that would utilize the airspace associated with military
 training flight areas.
- USFWS and state wildlife agencies expressed some concerns about the potential for adverse effects from military overflights on waterfowl in waterfowl habitat areas and on bighorn sheep in their lambing areas. (see analysis in Section 2.3.2.1 WS does not conduct aerial hunting actions in those types of areas unless requested by responsible wildlife management agencies; conversely, in other states, WS has been requested to protect waterfowl nesting areas from coyote predation impacts, and aerial hunting has been used to meet those objectives to enhance waterfowl populations).
- It can be concluded that the activities associated with the Colorado Airspace Initiative (the preferred alternative in ANG (1997a)) will not adversely affect wildlife species within the region of influence.

The ANG (1997a) EIS analysis thus shows that military overflights, even where they occur on a regular basis up to many hundreds of times a year over specific areas, are not likely to result in adverse effects on wildlife.

Chapter 2

ANG (1997a) described the locations of areas in and routes on which military training flights occur in Colorado. The areas, Military Operations Areas (MOAs) and training flight routes are shown in Figure 5. Except for several counties in southcentral Colorado (Alamosa, Costilla, Saguache, Fremont, Custer), none of the MOAs or training routes occur in the western half of Colorado, which is where 88% of WS aerial hunting time occurs in the State (based on data from FY02 to FY04). Therefore, virtually no potential exists for military training flights to add to the cumulative impacts

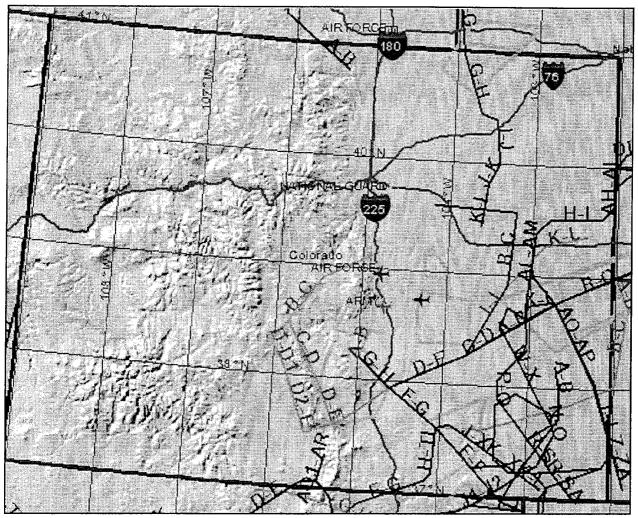


Figure 5. Military operations areas (gray outlined polygon areas) and training flight routes (dark lines with hyphenated letter designations) in Colorado (map obtained @ http://www.usahas.com/bam/).

analysis of WS aerial hunting activities in western Colorado because, for all practical purposes, few, if any, military training flights occur in western Colorado.

WS has aerially hunted in eight counties (Alamosa, Baca, Costilla, Crowley, Las Animas, Lincoln, Otero, and Weld Counties) where military training flights occurred from FY02 to FY04 (Table 12). The total hours of WS aerial hunting flights in a year and the number of flights WS has conducted in those 8 counties add only a small incremental increase to the military training flight time and numbers (called "sorties"). When the number of WS flights is added to military sorties, WS's flights range from 0.2% to 8.3% of the total flights in those Counties. Therefore, WS flights do not add appreciably to the total number of overflights in any of the affected counties. In conclusion, since ANG (1997a, 1997b) found no significant impacts to wildlife with the hundreds of military overflights that are conducted annually, WS with

the few aerial hunting overflights it has conducted annually would not add appreciably to a level with significant impacts to disrupt wildlife, especially considering the lower number of aircraft overflights by WS and the much quieter aircraft used by WS.

Table 12. Estimated maximum number of WS aerial hunting flights from FY02 to FY04 in Colorado counties where

military training flights ("sorties") occur (ANG 1997a).

WS Aerial Hunting Hrs and Overflights for FY02 - FY04		Number of Military Sort	WS's Flights as % o Total Flights		
	Max Hrs/Yr	Est. No. of Fits.	MOA or Training Route No. of sorties		Total Flights
Alamosa	10.4	11	VR-413	176	
Alamosa Total	10.4	11	l MOA/Rt	176	5.9%
Costilla	5.3	6	VR-413	176	
Costilla Total	5.3	6	1 MOA/Rt	176	3.3%
Las Animas	9.5	10	Pinon Canyon MOA	62	7.5
		<u> </u>	Two Buttes Low MOA	475	1
			Two Buttes High MOA	845	
		ŀ	IR-409 Whole Route	53	
			IR-409 Segments F to I	845	
			XVR-1427 Whole Route	343	
			XVR-1427 Segments F to I	185	
Las Animas Total	9.5	10	7 MOAs/Rts	2.808	0.4%
Otero	38.4	39	Pinon Canyon MOA	62	
			Two Buttes Low MOA	475	
			Two Buttes High MOA	845	
Otero Total	38.4	39	3 MOAs/Rts	1.382	2.7%
Crowley	31.5	32	IR-415 Segments A-D	88	
			IR-414	62	
			XIR-424	211	
Crowley Total	31.5	32	3 MQAs/Rts	361	8.1%
Baca	3.4	4	Two Buttes Low MOA	475	
			Two Buttes High MOA	845	
	1		IR-409 Whole Route	53	
			IR-409 Segments F to 1	845	
Baca Total		4	4 MOAs/Rts	2,218	0.2%
Lincoln	8.0	8	IR-415 Segments A-D	88	
Lincoln Total	8.0	8	I MQA/Rt	88	8.3%
Weld	9.0	9	IR-416	62	the state of
	<u> </u>		XIR-426	62	
Weld Total	9.0	9	2 MOAs/Rts	124	6.8%
TOTAL COUNTIES	112.1	119	22 MOAs/ Rts	7.333	1.6%

Aerial Hunting by Other Agencies and Individuals

The only other aerial hunting that occurs in Colorado besides that performed by WS is by private individuals under a permit from either CDA (for livestock protection) or CDOW (if they approve it for wildlife protection). No permits for wildlife protection by private entities have been issued by CDOW in a number of years. CDA-permitted aerial hunting by entities other than WS has been very limited in terms of magnitude, frequency, and geographic scope. Only one private entity has been permitted to aerial hunt in the State in any one of the last 5 years. Table 13 shows that private aerial hunting has occurred in only 5 of the 63 counties in the State in the last 5 years, and occurred in no more than 2 counties in any one year and under no more than one permit from CDA. The total number of coyotes killed by private aerial hunting was no more than 28 Statewide in one year. Although data on number of hours flown was not available

from the reports that CDA maintains, reasonable estimates indicate no more than 19 hours of private aerial hunting occurred in an entire year statewide or in any one of the affected counties (Table 13). Also, none of the permits authorized aerial hunting on federal public lands (M. Threlkeld, CDA, pers. comm. 2005). Therefore, private aerial hunting has had no potential to contribute to cumulative impacts from overflight effects to wildlife on public lands.

A more detailed look at the total number of private and WS aerial hunting hours was given in Table 9. During the last three years, FY02-FY04, WS conducted aerial hunting activities in Moffat, Rio Blanco, and Lincoln counties where private aerial hunting also occurred (Tables 9 and 13). When added to WS's aerial hunting hours, the private aerial hunting hours constituted no more than 7% or 3% of total aerial hunting hours in Rio Blanco and Moffat Counties, respectively, in any of the three years. In Lincoln County where private aerial hunting occurred during only during 2002 in the last five years, total aerial hunting hours were minor; no more than 15 of the 936 total aerial hunting hours occurred in Lincoln County during that year (private and WS aerial hunting hours were about equal in Lincoln County in that year). It is expected that private aerial hunting will not increase above levels that occurred over the last several years unless WS reduces its aerial hunting activities (M. Threlkeld, CDA, pers. comm. 2005). Therefore, we find no reason to expect effects on coyote populations or of overflights on other wildlife from private aerial hunting to increase over the levels that have occurred recently (M. Threlkeld, CDA, pers. comm. 2005). The levels of private aerial hunting that have occurred and are expected to occur in future years should thus have no potential to lead to significant cumulative impacts on wildlife when added to military training flights and WS's aerial hunting flights.

Table 13. Number of coyotes killed and estimated number of hours of aerial hunting by private entities in Colorado from 2001 through 2005 (partial year, Jan. to Aug, report for 2005) obtained from required reports for aerial hunting permits issued by CDA. Those reports give the numbers of coyotes killed by the permittee, but not the actual number of hours flown. Therefore, we estimated number of hours flown from coyote take data by assuming that private aerial hunters had success rate ½ of the average success rate of WS aerial hunting coyote take over the last 10 years (3.0 coyotes per hour flown). This estimate should result in an overstatement of the number of hours flown by private entities and, therefore, an overstatement of their potential overflight impacts.

	Counties Where Private Aerial Hunting Occurred								
	Prowers & Baca (on a ranch split by a border between 2 counties)		Lin	coln	Moffat & Rio Blanco (on a ranch split by a border between 2 counties)				
Year	Coyotes Killed	Est. Hrs Flown	Coyotes Killed	Est. Hrs Flown	Coyotes Killed	Est. Hrs Flown			
2001	17	11	-	-	-				
2002	· <u>-</u>	-	11	7	-	-			
2003	-	-	-	-	13	9			
2004	_	-	-	_	28	19			
2005		-	<u> </u>		22	15			

Other Types of Aircraft Flights

At least one comment received from the public expressed that commercial aircraft flights could present concerns about cumulative impacts on wildlife when considered together with WS aerial hunting overflights. However, most such flights occur at such high altitudes (generally more than 30,000 feet), that they present virtually no potential to disturb wildlife and we are unaware of any scientific evidence to the contrary. Therefore, we conclude such flights have no potential to contribute to cumulative impacts on wildlife that are affected by or exposed to WS aerial hunting overflights.

Conclusions about Cumulative Impacts from Overflights

There is no obvious "threshold" of significance when it comes to the cumulative effects of overflights on wildlife. This is because our analysis and the considerable analysis of ANG (1997a, 1997b) show that, despite considerable research on numerous wildlife species, no scientific evidence exists that indicates any substantive adverse effects on wildlife populations will occur as a result of any of the types of low level or other overflights that do or may occur in Colorado. It is apparent that WS's aerial hunting activities that have occurred, or may occur in the future, within the same areas

flown by military training flights are an inconsequential addition to what have already been found by analysis in an EIS to have little to no potential for causing adverse impacts on any wildlife species populations, despite the fact that the military training flights are far more numerous and produce far greater noise levels than the small aircraft used by WS. The information above on non-WS (private or state) aerial hunting overflights indicates that they are too few in frequency or geographic scope to suggest any possibility of adding significantly to any cumulative adverse effects. This is because the evidence from available studies, particularly those involving military aircraft, suggests adverse effects do not occur even when flights are far more frequent than when private or WS aerial hunting activities occur in specific areas.

The geographic scope of WS's aerial hunting activities in Colorado is limited - on a land area basis, less than 5% of Colorado, less than 5% of USFS lands, and about 10% of BLM lands are exposed to some level of aerial hunting in a typical year. Frequency of WS's aerial hunting flights on areas of federal public land are also low - only about 0.1% of BLM grazing allotments in the State are exposed to 10 or more aerial hunting flights in a year; no allotment had more than 15 flights in one year; and flights on even the most heavily aerial hunted areas occur on less than 5% of the days in a year. On USFS allotments, only 0.03% of all USFS allotments were exposed to 10 or more flights in a typical year; no allotment had more than 17 flights in one year; and flights on even the most heavily aerially hunted areas occur on less than 3% of the days. Even if such overflights increased ten-fold, available scientific evidence as discussed in Sections 2.3.2.1 indicates wildlife species would not be adversely affected because most species are tolerant or habituate to overflights. WS's standard practice of avoiding concentrations of big game animals while conducting aerial hunting activities further lessens the already low to nonexistent potential for such flights to adversely affect their populations.

Our analysis indicates that the scientific evidence does not support the conclusion that aerial overflights by WS, or cumulatively when added to other types of overflights, have significant impacts on wildlife. There is considerable scientific evidence presented herein that overflights do not adversely affect wildlife. That fact by itself goes a long way toward providing qualitative support for a finding that there is no potential for significant adverse effects on the quality of the human environment, either on a State-wide basis or at the local level, from WS overflights. In conclusion, we have found no evidence to suggest that overflights effects on wildlife, even cumulatively, would result in significant impacts on wildlife species populations, let alone result in effects on such populations that would rise to the level of causing a significant impact on the quality of the human environment.

2.3.3 Effects of WS PDM on Unique Characteristics of Geographic Areas.

A number of different types of Federal lands occur within the analysis area such as WAs, Wilderness Study Areas (WSAs), Future Planning Areas (FPAs), National Conservation Areas, National Historic Sites, and Areas of Critical Environmental Concern (ACECs) which currently have special designations because of their unique characteristics and may require special considerations for conducting PDM. These are collectively referred to as Special Management Areas (SMAs). WS recognizes that some persons interested in SMAs may feel that any PDM activities in these areas adversely affect area aesthetic and natural qualities or values and ecosystem. WS abides by the laws, regulations, and policies such as the Wilderness Act to minimize any effect on the public, but conducts PDM as allowed to reduce damage in the SMAs. Many SMAs allowed grazing long before being so designated and continue to allow it. PDM has been conducted on some of these areas. However, WS has conducted PDM on only a few SMA grazing allotments for the protection of livestock in the last few years and anticipates that this would be the level in the future. WS complies with WS guidelines and policies when conducting PDM in these areas. Current laws and regulations allow the public and WS to conduct PDM activities in SMAs under certain limitations. PDM in SMAs is only a very minor component of the current program. Currently, private individuals using firearms and trail hounds can sport hunt or conduct PDM in most SMAs under CDOW or CDA regulations. These activities are not restricted by BLM or USFS in most SMAs.

BLM SMAs. WS PDM in WAs, WSAs, and other SMAs would conform with any and all federal and state laws and regulations that have been determined to apply to WS activities. WS PDM in SMAs has occurred only to a very minor degree in the current program and the need for such activity in SMAs is expected to remain minor. The BLM has not imposed any restrictions on most PDM methods in any SMAs in the State. Previously, the only exception was in the BLM Interim Management Policy and Guidelines for Lands Under Wilderness Review (BLM 1995a), which established

several restrictions on PDM in WSAs¹³. That policy did not purport to restrict in such areas the use of other PDM methods including those that are also involved in sport hunting and private or state agency PDM activities, such as the use of firearms or trail hunting dogs. Therefore, WS use of such methods under WS authorities would be consistent with BLM management direction in such areas. BLM revised its policy for management of WSAs in 2004 (C. McCluskey, Senior Wildlife Specialist, BLM, pers. comm. 2005) and we are awaiting final interpretation of the effect of the policy changes. WS did not aerial hunt in any of the WSA portions of BLM grazing allotments associated with WSAs during FY 2002-2004 (see Table 10).

WS's annual coordination process with BLM provides the BLM with the opportunity to identify any conflicts that WS activities might have with established management plans or goals for SMAs. If WS activities were to be found to conflict with such management plans or goals, then WS would either avoid conducting the activity or would engage in further NEPA analysis as appropriate in coordination with the BLM. In FY03 and FY04, WS conducted coyote control with calling and shooting, and aerial hunting on one BLM SMA, the Gunnison Gorge National Conservation Area, for sheep predation and deer protection. In FY03 and FY04, WS killed 6 and 1 coyotes on the 34 mi² and 6 mi² worked, respectively.

USFS SMAs. WS follows policies outlined in the USFS Manual, particularly Section 2323, and the National MOU between USFS and WS when conducting PDM in USFS SMAs such as WAs, WSAs, and FPAs. Additionally, the LRMP provides guidance for USFS to determine if PDM objectives are compatible with land management objectives. For example, WS does not conduct PDM in USFS specially designated areas (i.e., trailheads, campgrounds) except for emergency human health situations. Proposed WS PDM plans are reviewed by USFS during the work planning process to ensure that areas of conflict with the LRMP, including any SMAs, do not exist. Therefore, we expect no potential for WS PDM to have any adverse effect on wilderness characteristics or management objectives of SMAs. Proposed PDM in USFS SMAs would primarily be limited in scope to grazing allotments with a limited buffer zone for the protection of livestock, but could also on occasion occur for the protection of wildlife if requested by the CDOW. PDM in SMAs would not impair the values of such areas and the intent of Congress designating them as such.

WS PDM activity on USFS SMAs has been very limited. In FY03 and FY04, WS conducted PDM on 2 USFS SMAs: the Flat Tops WA - to use trail dogs to pursue black bears that had killed livestock outside of the wilderness (none were taken); and the Weminuche WA (about 38 mi² area of the WA) for coyote and bear predation of sheep - WS used calling and shooting to target coyotes and trail dogs to target black bear; 1 bear and 3 coyotes were killed in FY03 and in 2 coyotes were killed in FY04. No aerial hunting by WS occurred on any FS WAs during those years.

Other SMAs. "Areas of Critical Environmental Concern" and certain other types of SMAs are managed for the protection of certain qualities or values such as biological, riparian, cultural, historic, scenic, geological, paleontological, recreation, rangeland, or sensitive plant species. PDM could on occasion be requested to occur in such an area. Methods of PDM that WS might use operationally on such areas (e.g., aerial hunting, ground-based shooting) do not affect any of these resource values. If an SMA has been specifically designated to protect a wildlife species that could potentially impacted by PDM (these species are discussed in the EA in Section 2.2.2) then special restrictions might be needed. In general, PDM has not been needed in these areas primarily because livestock are not often allowed to graze on them. However, it may be conducted on such areas if the need arises, especially during a human health and safety crisis. Similar to other types of BLM and USFS SMAs discussed above, sport hunting and PDM by private individuals using firearms and trail hounds generally is not restricted in these areas. The land management agency (BLM and USFS) is responsible for identifying any conflicts that PDM might have with the management of an SMA in the annual interagency coordination work planning process. If, for example, the respective federal land management agency determines that an area with special management emphasis is to be closed to all access and/or the use of firearms, or to all low level flights, then WS would abide by those restrictions unless provided a special exemption.

E.g. requirements to target individual offending animals and to obtain BLM State Director approval before aerial hunting may occur.

These requirements were eliminated by policy revision completed in 2004.

SMAs in Colorado. Colorado has many SMAs. A list of the majority of SMAs in Colorado is given below. These areas were analyzed to determine potential impacts of the current WS program to their unique characteristics. PDM as conducted by Colorado WS does not have an impact on cultural, historical, geological, and plant resources because habitat is not impacted by WS in PDM. WS PDM also does not impact amphibians, fish, and invertebrates in Colorado. PDM has no potential to affect scenic qualities and has only minor potential to affect aesthetic qualities of SMAs because WS works on relatively few SMAs as discussed in this section. Although WS has the potential to take some species of birds and mammals in PDM, WS is not likely to impact these species under the current program (see Sections 4.1.1.1 and 4.1.2.1). Several SMAs have been set aside for wildlife protection, especially big game wintering areas. Analysis of WS's potential to affect big game, including on wintering areas, is in Section 2.3.2. Other wildlife that are protected are many of the T&E species listed in Table 7 (these are discussed in Sections 2.2.2 and 4.1.2 and potential effects are considered in detail statewide, whether they occur on an SMA or elsewhere) and sensitive species shown in Table 14 that are found on some of the SMAs.

COLORADO WILDERNESS AREAS/NATIONAL PARKS/HISTORIC SITES

Bents Old Fort National Historic Site (NPS)

Black Canyon of the Gunnison National Park (15,599 acres,

NPS, Gunnison NF, Uncompangre RA)

Black Ridge Canyons (Grand Jet RA)

Buffalo Peaks (43,410, Pike, San Isabel NFs)

Byers Peak (8,913 acres, Arapaho, Routt NFs)

Cache La Poudre (9,238 acres, Roosevelt NF)

Collegiate Peaks (166,938 acres, White River, San Isabel, Gunnison NF)

Colorado National Monument (NPS)

Comanche Peak (66,791 acres, Roosevelt NF)

Curecant National Recreation Area (NPS)

Dinosaur National Park (210,000 acres, NPS)

Eagles Nest (132,906 acres, Arap., White River NFs)

Flat Tops (235,035 acres, Routt, White River NFs)

Florissant Fossil Beds National Monument (NPS)

Fossil Ridge (31,534 acres, Gunnison NF)

Great Sand Dunes National Park/Preserve (33,450 acres, NPS, San Isabel NF)

Greenhorn Mountain (22,040 acres, San Isabel NF)

Gunnison Gorge (17,700 acres, Gunnison NF, Uncompangre RA)

Holy Cross (122,797 acres, San Isabel, White River NF)

Hunter - Fryingpan (81,866 acres, White River NF)

Indian Peaks (73,291 acres, Arapaho, Roosevelt NFs)

La Garita (128,858 acres, Gunnison, Rio Grande NFs)

Lizard Head (41,193 acres, San Juan, Uncompangre NFs)

Lost Creek (119,790 acres, Pike NF)

Maroon Bells - Snowmass (181,117 acres, Gunnison, White River NFs)

Mesa Verde National Monument (8,100 acres, NPS)

Mount Evans (74,401 acres, Arapaho, Pike NFs)

Mount Massive (30,540 acres, San Isabel NF)

Mount Sneffels (16,565 acres, Uncompangre NF)

Mount Zirkel (159,935 acres, Routt NF)

Neota (9,924 acres, Roosevelt, Routt NFs)

Never Summer (20,747 acres, Arapaho, Routt NFs)

Platte River (23,492 acres, Routt NF)

Powderhorn (61,510 acres, Gunnison NF, Gunnison RA) Ptarmigan Peak (12,594 acres, Routt, White River NFs) Raggeds (64,992 acres, Gunnison, White River NFs)

Rawah (73,068 acres, Roosevelt, Routt NFs)

Rocky Mountain National Park (210,000 acres, NPS)

Sand Creek Massacre National Historic Site (NPS)

Sangre De Cristo (226,420 acres, Rio Grande, San Isabel NFs)

Sarvis Creek (47,190 acres, Routt NF)

South San Juan (158,790 acres, Rio Grande, San Juan NFs)

Uncompangre (Big Blue) (102,721 acres, Uncompangre NF)

Vasquez (12,986 acres, Arapaho, Routt NFs)

Weminuche (492,418 acres, San Juan, Rio Grande NFs)

West Elk (176,172 acres, Gunnison NF)

WILDERNESS STUDY AREAS AND FUTURE PLANNING AREAS

Adobe Badlands (Uncompangre RA)

American Flats (Gunnison RA)

Bangs Canyon (Grand Jet RA)

Beaver Creek (Royal Gorge RA)

Black Mountain/Windy Gulch (White River RA)

Browns Canyon (Royal Gorge RA)

Bull Canyon (White River RA)

Bull Gulch (Glenwood RA)

Camel Back (Uncompange RA)

Cahone Canyon (San Juan RA)

Castle Peak (Glenwood RA)

Cold Springs Mountain (Little Snake RA)

Cross Canyon (San Juan RA)

Cross Mountain (Little Snake RA)

Deep Creek (Glenwood RA)

Demaree Canyon (Grand Jct RA)

Diamond Breaks (Little Snake RA)

Dinosaur National Monument Additions - Ant Hills, Chew Winter Camp, Peterson Draw, Tepee Draw, Vale of Tears

(Little Snake RA)

Dolores River Canyon (San Juan, Uncompahgre RAS)

Dominguez Canyon (Grand Jct, Uncompanger RAS)

Flat Tops Addition - Hack Lake (Glenwood RA)

Granite Creek (Uncompangre RA)

Grape Creek (Royal Gorge RA)

Great Sand Dunes Addition (La Jara RA)

Gunnison Gorge (Uncompangre RA)

Handies Peak (Gunnison RA)

Hunter Canyon (Grand Jet RA) James Peak SMA (Arapaho NF) Little Bookeliffs (Grand Jet RA) Mares Tail -Squaw/Papoose Canyons (San Juan RA)

Maroon Bells-Snowmass Additions (Glenwood RA)

McIntyre Hills (Royal Gorge RA)

McKenna Peak (San Juan RA)

Oil Springs Mountain (White River RA)

Piedra SMA (San Juan NF)

Pinion Ridge (White River RA)

Platte River Addition (Kremmling RA)

Redcloud (Gunnison RA)

Rio Grande (La Jara RA)

Roan Plateau (Grand Jet RA)

Roubideau (Uncompangre NF/RA)

San Luis Hills (La Jara RA)

Sewemup Mesa (Grand Jct RA)

Skull Creek (White River RA)

Snaggletooth (San Juan RA)

South Shale Ridge (Grand Jct RA)

Tabeguache SMA (Uncompangre NF/RA)

The Palisade (Grand Jct RA)

Thompson Creek (Glenwood RA)

Troublesome (Kremmling RA)

Unaweep (Grand Jct RA)

Vermillion Basin (Little Snake RA)

Weber-Menefee Mountains (San Juan RA)

West Elk Addition (Gunnison RA)

Willow Creek (White River RA)

Yampa River (Little Snake RA)

NATURAL AREAS BY COUNTY

ALAMOSA - Zapata Falls

BACA - Comanche Grassland, Shell Rock Canyon

BOULDER - Colorado Tallgrass Prairie, South Boulder Creek, White Rocks

CHAFFEE - Droney Gulch

CLEAR CREEK - Mount Goliath

CONEJOS - Rajadero Canyon

CUSTER - Brush Creek Fen

DELTA - Needle Rock

DOLORES - Narraguinep

DOUGLAS - Castlewood Canyon, Roxborough State Park

EL PASO - Aiken Canyon, Hurricane Canyon

FREMONT - Arkansas Canyonlands, Garden Park Fossil Locality, High Mesa Grassland, Indian Springs Trace Fossil Locality, and Mini-Wheeler (Stirrup Ranch Geologic), Phantom Canyon

GRAND - Kremmling Cretaceous Ammonite Locality, Paradise Park

GUNNISON - Gothic, Mexican Cut, Mount Emmons Iron Bog, and South Beaver Creek

HINSDALE - Redcloud Peak, Slumgullion Earthflow

HUERFANO - Cucharas Canyon

JACKSON - East Sand Dunes, North Park

JEFFERSON - Dakota Hogback, Ken-Caryl Ranch

LARIMER - Blue Mountain - Little Thompson, Owl Canyon Pinyon Grove, Jimmy Creek, Park Creek, Sand Creek, Specimen Mountain, and West Creek

LOGAN - Tamarack Ranch

MESA - Badger Wash, Fruita Paleontological Locality, Gateway Palisade, Gunnison Gravels, Pyramid Rock, Rabbit Valley, Rough Canyon, and Unaweep Seep

MINERAL - Wheeler Geologic

MOFFAT - Cross Mountain Canyon, Irish Canyon, Limestone Ridge, Lookout Mountain

MONTEZUMA - McElmo

MONTROSE - Escalante Canyon, Fairview, San Miguel River at Tabeguache Creek

PARK - High Creek Fen, Saddle Mountain, Treasurevault Mountain

RIO BLANCO - Black Gulch, Coal Draw, Coal Rim, Deer Gulch, Duck Creek, Dudley Bluffs, East Douglas, Lower Greasewood Creek, Raven Ridge, South Cathedral Bluffs, Yanks Gulch / Upper Greasewood Creek

RIO GRANDE - Elephant Rocks

ROUTT - California Park

SAGUACHE - Indian Spring, Mishak Lakes

SUMMIT - Mosquito Pass

TELLER - Dome Rock

WELD - Chalk Bluffs

YUMA - Bonny Prairie

Table 14. Sensitive mammal and bird species found in Natural Areas and other SMAs in Colorado. WS conducts little PDM on SMAs in Colorado and methods are restricted by Amendment 14. Only species negatively impacted by PDM is the swift fox (see Chapter 4 for analysis of impacts).

Species	Scientific Name	CNHP# State Rank	Where Found	Habitat	When Found	Effects of PDM	
MAMMALS							
Cliff Chipmunk	Tamias dorsalis	S2	Moffat Co.	Pinyon-juniper	All year	0	

Species	Scientific Name	CNHP# State	Where Found	Habitat	When Found	Effects of PDM
	İ	Rank			Found	PDM
Dwarf Shrew	Sorex nanus	S2	Central Foothill	Woods	All year	0
Ord's Kangaroo Rat	Dipodomys ordii priscus	S3	Moffat Co.	Open sandy	All year	0
Pygmy Shrew	Sorex hoyi montanus	S2	Jackson Co.	Wooded-open	All year	0
Silky Pocket Mouse	Perognathus flavus sanluisi	S3	San Luis Valley	Shortgrass	All year	0
White-tailed Prairie Dog	Cynomys leucurus	S4	Northwest	Prairie	All year	0
Brazilian Free-tailed Bat*	Tadarida brasiliensis	SI	Scattered sites	Caves-bldgs.	Summer	0
Swift Fox*	Vulpes velox	S3	Eastern Colo.	Plains	All year	-, 0, +
	Birds					
American peregrine falcon	Falco peregrinus anatum	S3	Western Colo.	Variety	All year	0
Black swift	Cypseloides niger	S3	Western Colo.	Cliffs	Summer	0
Bobolink	Dolichonyx oryzivorus	S3	North-central	Grassland	Breed	0
Columbian sharp-tailed grouse	Tympanuchus phasianellus columbianus	S2	Western Colo.	Grass-shrublands	All year	0, +
Grace's warbler	Dendroica graciae	S 3	Southwest	Pine-oak	Breed	0
Gray vireo	Vireo vicinior	S2	Western Colo.	Pinyon-juniper	Breed	0
Greater sandhill crane	Grus canadensis tabida	S2	Northwest	Marsh-grassland	Breed S	0, +
Lewis's woodpecker	Melanerpes lewis	S4	Western Colo.	Open woodlands	All year	0
Northern sage-grouse	Centrocercus urophasianus	S4	Northwest	Sage	All year	0, +
Ovenbird	Seiurus aurocapillus	S2	Eastern Colo.	Decid. oldgrowth	Breed	0
Prairie falcon	Falco mexicanus	S4	Statewide	Prairie	All year	0
Sage sparrow	Amphispiza belli	S2	Western Colo.	Sage	Breed	0
White-faced ibis	Plegadis chihi	S2	Statewide	Marsh-grassland	Breed	0, +
Black-necked stilt*	Himantopus mexicanus	S 3	Statewide	Wetlands	Breed	0, +
Boreal owl*	Aegolius funereus	S2	North-central	Boreal forest	All year	. 0
Brown-capped rosy-finch*	Leucosticte australis	S3	Western Colo.	Alpine	All year	0
Ferruginous hawk*	Buteo regalis	S3	Statewide	Open Prairie	All year	0
Greater prairie-chicken*	Tympanuchus cupido	S3	Northeast	Grassland	All year	0, +
McCown's longspur*	Calcarius mccownii	S3	North-central	Grassland	Breed	0
Mountain plover*	Charadrius montanus	S2	Eastern Colo.	Prairie	Breed	0
Northern goshawk*	Accipiter gentilis	S3	Western Colo.	Forest	All year	0
Northern pygmy-owl*	Glaucidium gnoma	S3	Western Colo.	Woodlands	All year	0
Veery*	Catharus fuscescens	S3	Western Colo.	Moist woods	Breed	0
White-tailed ptarmigan*	Lagopus leucurus	S4	Central Colo.	Alpine	All year	0, +
White-winged crossbill*	Loxia leucoptera	S1	Western Colo.	Conifer forest	Winter	0
Willow flycatcher*	Empidonax traillii	S4	Statewide	Riparian woods	Breed	0
Wilson's phalarope*	Phalaropus tricolor	\$4	Statewide	Wetland	Breed	

State Rank (relative rarity or endangerment of the element in the state) S1-Critically imperiled S2-Imperiled S3-Rare S4-Widespread, but long-term concern (for info on Natural Areas see website @http://parks.state.co.us/cnap/NAinfo.htm)

*Very likely to occur, but not found in surveys.

#CNHP = Colorado Natural Heritage Program

Unique features of current designated WAs, National Monuments and Historic Sites, WSAs, FPAs, and Natural Areas are primarily scenery, native communities with rare plants and animals, and geological, cultural, historical, and paleontological values. Table 14 gives the species being monitored in Natural Areas in Colorado and, of the species, WS PDM only could impact the swift fox, however minor. Impacts to the swift fox are discussed in Section 4.1.1.1. WS PDM is restricted in these areas to target-specific methods, and thus, WS does not impact these species negatively. However, WS PDM could have benefits for several species as discussed in 1.3.3.6. Of the species listed, WS PDM could potentially benefit 8 species by removing predators that prey on nests or the species themselves.

2.3.4 Cumulative Effects on Wildlife Populations from Oil and Gas Development, Timber

Harvesting, Land Development, and Grazing

A few public comments were received that expressed concerns that there may be significant cumulative impacts on the wildlife species that WS impacts with PDM because of past, present, and future impacts from other activities such as oil and gas development, timber harvesting, other land development actions such as residential subdivision development, and grazing. WS has no authority to affect decisions of other entities that engage in or approve such actions. Thus, they are not related or connected to WS actions. The effects of such actions by other agencies and entities are part of the existing environmental status quo and those effects neither increase nor decrease as a result of WS PDM activities (see additional discussion about grazing impacts in Section 2.3.9 below).

The BLM and USFS approve and regulate oil and gas development, timber harvesting, and grazing on federal public lands and have previously evaluated the potential for cumulative effects on numerous wildlife species because of their land management decisions for those types of activities. We refer the reader to those agencies and analyses to determine in more detail the extent of impacts of such activities on wildlife in specific areas (BLM 1983, 1984a, 1984b, 1985a, 1985b, 1986, 1988, 1991a, 1991b, 1991c, 1991d, 1991e, 1991f, 1991g, 1992, 1995b, 1996, 1999a, 1999b, USFS 1984, USFS 1991, USFS 1997, USFS 1998, USFS 2002, USFS 2005).

The following discussion is provided to explain what potential, if any, WS PDM actions have for contributing to cumulative effects on wildlife species and the environment that have resulted from non-WS related actions by others (the environmental baseline). In Chapter 4 of this EA, we also provide additional discussion and analysis of cumulative impacts on various wildlife species relevant to the cumulative effects from WS's aerial hunting and other PDM activities.

Adverse impacts on some wildlife can result from land management and development activities. Housing developments in rural areas have been recognized as having adverse effects on wildlife by diminishing habitat (Gill 1999). Oil and gas development can adversely affect certain wildlife species by reducing the amount of available habitat for them. Road building and establishment of well pads (sites where wells are drilled to pump oil or gas out of the ground) reduce habitat directly by removing vegetation that animals use for food and hiding cover. Timber harvest can benefit some wildlife species while negatively affecting others (USFS 1998). For example, deer and elk generally benefit from the creation of openings in large expanses of mature forest. Roads established to support oil and gas development and timber harvesting further indirectly reduce the amount of habitat "effectively available" to certain species because of animals' fear of using areas where humans are traveling – this is considered "displacement effect" caused by roads. Wildlife species identified as being affected in this way include mule deer and elk.

WS has conducted at least some level of PDM activity on 7 of the 11 BLM Resource Areas (RAS) and in 11 of the 34 USFS Ranger Districts in the 7 National Forest system areas in Colorado over the last several years (FY 2002 - 2004)¹⁴. WS aerial hunting occurred on 6 BLM RAS (all of the 7 except for La Jara RA), and 4 of the 11 USFS Ranger Districts. Only two of the BLM RAS have had WS PDM activities occur on more than small proportions (i.e., more than 2%) of the identified grazing allotments in those areas - Little Snake and White River RAS. Nearly 92% of WS's aerial hunting on BLM lands has occurred on those two RAS. More than 96% of WS's aerial hunting on USFS lands occurs on the Routt and White River NFs. Therefore, the analysis here focuses on those areas of public land management jurisdiction

¹⁴ BLM Areas: Little Snake RA - WS PDM work conducted on 33 of 364 grazing allotments; White River RA (PDM on 23 of 153 allotments; Uncompaling Basin RA - PDM on 10 of 241 allotments; Glenwood Springs RA - PDM on 3 of 258 allotments; Gunnison RA - PDM on 2 of 134 allotments; Grand Junction RA - PDM on 1 of 235 allotments; and La Jara RA - PDM on 1 of 72 allotments).

USFS Areas: Routt NF - PDM on 39 of 139 grazing allotments; White River NF - PDM on 12 of 135 allotments; San Juan NF - PDM on 5 of 176 allotments; Grand Mesa, Uncompaligne, Gunnison NFs - PDM on 4 of 195 allotments; Rio Grande NF - PDM on 2 of 121 allotments; Pike-San Isabel NFs and Commanche NG - PDM on 4 of 271 allotments.

because they represent areas where there would be the greatest potential for WS PDM to contribute to adverse cumulative effects on wildlife of all public land areas of the State.

In an EIS (BLM 1991a) covering oil and gas leasing and development in 5 BLM Resource Areas in Colorado, the BLM stated that indirect impacts on some wildlife species would be from the loss of 17,900 acres of habitat over a 20-year period because of ground surface disturbance which is minor compared to the 5.1 million acres of federal oil and gas mineral estate in the 5 RAS evaluated. Other impacts were qualitatively discussed but we could find no quantitative measures of such effects described. The BLM's Records of Decision for oil and gas leasing and development in the 5 RAS adopted a number of mitigation measures described in the EIS to protect wildlife habitat for the purposes of preventing substantial adverse effects on wildlife populations. The mitigation measures included habitat improvement efforts and stipulations or conditions on leases such as "Conditions of Approval", "No Surface Occupancy", and "Timing Limitations", each designed specifically to protect important wildlife habitat. The BLM concluded that cumulative impacts on wildlife from implementing their proposed oil and gas development proposed action would be insignificant (BLM 1991a) and has subsequently reported that less than one percent of the total acreage managed by BLM experiences surface disturbance from oil and gas activity (BLM 2005). Therefore, it appears that BLM has implemented effective mitigation measures to avoid significant adverse effects on wildlife from oil and gas development on BLM lands on the 5 Resource Areas.

We reviewed BLM and USFS EIS documents covering the areas of federal public land where WS conducts the majority of its PDM and aerial hunting activities (Little Snake and White River BLM RAS and on the Routt and White River NFs) that occur on public lands in Colorado. This review was to determine species identified as being potentially impacted by land management activities (including oil and gas development, timber harvesting, and livestock grazing) and for which restrictions or mitigation measures have been established to minimize such impacts. Then we made a determination of whether WS PDM, including aerial hunting, has any real potential for contributing to or causing significant adverse impacts on any of those wildlife species identified as the "affected environment" components that WS PDM actions impact. The "affected environment" is what is affected by WS PDM actions, namely, those wildlife resources affected by WS PDM actions in Colorado. In other words, we looked at the impacts on wildlife resources caused by approved oil and gas development and timber harvesting on federal lands and analyzed and determined whether those actions had effects on the same wildlife resources as those wildlife resources affected by WS PDM actions in Colorado.

Table 15 shows a list of wildlife species identified by the BLM and USFS as occurring on the above areas and as being potentially affected by the above land management activities. Table 15 also identifies the wildlife species on the list that could potentially be affected by WS PDM activities, including aerial hunting.

Table 15. Species identified by the Little Snake BLM Resource Area (RA), White River BLM RA, Routt National Forest (NF), and White River NF as being potentially affected by land management actions including energy and minerals development, timber harvesting, livestock grazing, and potential for Wildlife Services (WS) predator damage management (PDM) to affect.

Species	WS Potential for PDM Effect
Mule Deer	No adverse effect - evidence shows aerial overflights do not disturb mule deer (see Section 2.3.2.1); PDM may benefit mule deer (See Section 1.3.3.6); incidental disturbance would be infrequent or unlikely due to low frequency of aerial hunting flights, small % of land area exposed to flights; mule deer populations in general are stable or increasing and at or above CDOW herd objectives in a majority of areas;
Elk	No adverse effect - evidence shows aerial overflights do not disturb ungulates in general (see Section 2.3.2.1); PDM may benefit elk (See Section 1.3.3.6); incidental disturbance would be infrequent or unlikely due to low frequency of aerial hunting flights, small % of land area exposed to flights; elk populations in general are stable or increasing and above CDOW objectives
Pronghorn (Antelope)	No adverse effect - evidence shows aerial overflights do not disturb pronghorns (see Section 2.3.2.1); PDM may benefit pronghorn (See Section 1.3.3.6); populations in general are stable or increasing and above CDOW objectives; incidental disturbance would be infrequent or unlikely due to low frequency of aerial hunting flights, small % of land area exposed to flights.
Rocky Mtn. Bighorn Sheep	No adverse effect - WS aerial hunting does not occur in bighorn sheep habitat areas - such areas not suitable due to rugged terrain (see Section 2.3.2.1); other PDM methods use infrequent or unlikely to occur in such areas; PDM may benefit bighorns (See Section 1.3.3.6).
Sage Grouse	No adverse effect - WS avoids flying near identified lek sites which are visible from the air; incidental disturbance

	would be infrequent or unlikely due to low frequency of aerial hunting flights, small % of land area exposed to flights localized PDM may benefit grouse (See Section 1.3.3.6).
Waterfowl	No perceived potential to affect - PDM may benefit nesting waterfowl (See Section 1.3.3.6) 1; PDM does not occur in close proximity to wetland sites where most species occur; incidental disturbance would be infrequent or unlikely
Shorebirds	No perceived potential to affect - PDM may benefit nesting shorebirds (See Section 1.3.3.6); PDM does not occur in close proximity to wetland or riparian sites where most species occur; incidental disturbance would be infrequent or unlikely
White Pelican	No perceived potential to affect - PDM does not occur in close proximity to wetland sites where this species occurs incidental disturbance would be infrequent or unlikely
Greater Sandhill Crane	No perceived potential to affect - PDM may benefit nesting cranes (See Section 1.3.3.6); no WS PDM in these types of habitat areas; incidental disturbance would be infrequent or unlikely
Raptors (These Apply to All Raptors Below):	No perceived potential to affect- evidence shows aerial overflights do not cause significant disturbance of raptors (Sec Section 2.3.2.1); incidental disturbance would be infrequent or unlikely due to low frequency of aerial hunting flights, small % of land area exposed to flights.
Coopers Hawk	See explanation for raptors.
Northern Goshawk	See explanation for raptors; this species occurs mainly in forest areas unsuitable to aerial hunting.
Sharp-shinned Hawk	See explanation for raptors.
Swainson's Hawk	See explanation for raptors.
Red-tailed Hawk	See explanation for raptors.
Northern Harrier	See explanation for raptors.
Golden Eagle	See explanation for raptors; Standard operating procedures used by WS minimize risk of take with traps and snares.
Ferruginous Hawk	See explanation for raptors.
Peregrine Falcon	See explanation for raptors. PDM not likely to occur near peregrine nesting areas (cliffs) due to rugged terrain; no concerns expressed by FWS in See Section 7 consult (before species was delisted).
Merlin	See explanation for raptors.
Osprey	See explanation for raptors.
Bald Eagle	See explanation for raptors; standard operating procedures used by WS minimize risk of take with traps, snares and M 44s (See Sections 2.2.2.2, 3.4.2.2, and 4.1.1.2); under National Section 7 consult (USDA 1997 Appendix F);
Mex. Spotted Owl	See explanation for raptors; no concerns expressed by FWS in Section 7 consult for PDM.
Flammulated Owl	See explanation for raptors.
Boreal Owl	See explanation for raptors; species occurs in dense boreal forests not suitable for aerial hunting.
Coyote	Yes - take by WS plus others within level sustainable by population (See Section 4.1.1.1); coyotes highly adaptable to human land development so no cumulative impacts expected; trend in population stable over long term; impacts locally are short term; trend in Moffat County where highest levels of WS PDM conducted is stable over long term.
Mountain Lion	Yes - but no signif, adverse effects on deer, elk as prey base for lions; PDM may benefit deer; WS take of mt. lions minor to overall harvest allowed by CDOW; no signif, cumul, impacts on mt. lions popns expected (See Section 4.1.1.1); lions taken by WS probably taken by nonfederal entities if WS stops PDM for lions.
Black Bear	Yes - but no signif. adverse effects (See Section 4.1.1.1); no evidence of indirect adverse effects; bears taken by WS probably taken by nonfederal entities if WS stops PDM for black bears.
Pine Marten	Yes - but PDM for this species very minor, not likely to occur in most years (See Section 4.1.1.1).
Ringtail	Yes - but none taken by WS in past 5 years; target and nontarget take expected to be low in relation to population (See Section 4.1.1.1).
Canada Lynx	Yes - but no nontarget lynx ever taken in CO; no risk of nontarget take from methods allowable on public lands (aerial hunting, shooting); incidental take authorized per Section 7 consult, but not expected to occur (See Sections 2.2.2.2, 3.4.2.2, and 4.1.2.1); PDM may benefit lynx (See Sections 2.2.2.2 and 4.1.2.1).
Black-footed Ferret	No adverse effects (See Sections 2.2.2.2, 3.4.2.2, and 4.1.1.1); PDM to protect ferrets or monitor diseases benefits ferrets (See Sections 1.3.3.6, 2.2.2.2, and 4.1.2.1).
North American Wolverine	Yes - but none ever taken by WS in CO; species believed extirpated in CO (See Sections 2.2.2.2, 4.1.2.1).
Wild Horse	No - although aerial hunting occurs in WHHMAs, WS avoids flying near wild horses; fixed wing aircraft do not disturb; little, if any, helicopter use by WS in wild horse habitat (See Section 2.3.2.1).
Sharp-tailed Grouse	None - WS PDM would have no adverse effect (See Sections 2.2.2.2, 3.4.2.2, and 4.1.1.1); localized PDM may benefit species (See Sections 1.3.3.6 and 2.2.2.2).
Lesser Prairie Chicken	None - WS PDM would have no adverse effect (See Sections 2.2.2.2, 3.4.2.2, and 4.1.1.1); localized PDM may benefit species (See Sections 1.3.3.6 and 2.2.2.2).
Greater Prairie Chicken	None - WS PDM would have no adverse effect; localized PDM may benefit species (See Sections 1.3.3.6).
Black Tern	No adverse effect.
Olive-sided Flycatcher	No adverse effect.
Black Swift	No adverse effect.
Common Loon	No adverse effect.

Loggerhead Shrike	No adverse effect.
Lewis' Woodpecker	No adverse effect.
Fox Sparrow	No adverse effect.
Northern Three-toed	No adverse effect.
Woodpecker	
White-faced Ibis	No adverse effect.
Purple Martin	No adverse effect.
Golden-crowned Kinglet	No adverse effect.
Pygmy Nuthatch	No adverse effect.
Southwestern Willow	No adverse effect.
Flycatcher	
Common Flicker	No adverse effect.
Hairy Woodpecker	No adverse effect.
Pine Grosbeak	No adverse effect.
Warbling Vireo	No adverse effect.
Blue Grouse	No adverse effect.
Ptarmigan	No adverse effect.
Vesper Sparrow	No adverse effect.
Sagebrush Vole	No adverse effect.
Brown Capped Rosy Finch	No adverse effect.
Wilson's Warbler	No adverse effect.
Blue-gray Gnatcatcher	No adverse effect.
Green-tailed Towhee	No adverse effect.
Wood Frog	No adverse effect.
Townsend's Big-eared Bat	No adverse effect.
Spotted Bat	No adverse effect.
Pygmy Shrew	No adverse effect.
Dwarf Shrew	No adverse effect.
Prairie Dog Spp.	No adverse effect; PDM to protect reintroduced ferrets may result in some benefit to species by reducing predation.
Beaver	No adverse effect.
Red-backed Vole	No adverse effect.

The information in Table 15 along with the analyses herein show that WS PDM activities have not contributed, and are not expected to contribute, to adverse effects on most of the wildlife species affected by BLM and USFS land management decisions. Likewise, the effects of oil and gas development and timber harvesting on wildlife resources typically do not affect the same wildlife resources that WS PDM actions affect, and when they do, it is usually only indirectly and insignificant. Thus, there are no cumulatively significant impacts on the affected environment, namely the same wildlife species that WS PDM actions directly affect and that are in some way directly or indirectly affected by BLM and USFS land management decisions (see discussion below). The existing environmental condition created by these other federal land management decisions, as well as other activities and decisions by private landowners and managers, is the "environmental status quo". WS has no ability to affect or change, by any decision we can make in this NEPA process, the "status quo" for the wildlife species that have been affected by those other activities and land management decisions. Since our proposed PDM actions do not contributed, and are not expected to contribute, to adverse effects on most of the wildlife species affected by BLM and USFS, our PDM actions will not change the status quo regarding those species. Accordingly, we find no reason to conclude that WS's proposed action here would result in any significant cumulative impacts on the quality of the human environment when considered together with the impacts of those other activities and decisions.

Even though BLM's or USFS's land management decisions regarding different activities, for example, oil and gas development, timber harvesting, and other types of land uses, have perhaps caused significant effects on certain wildlife species populations in certain localized areas through habitat alteration and disturbance, WS PDM actions do not contribute to any cumulative impacts on habitat because its PDM activities do not cause habitat destruction or alter habitat. Since WS PDM actions do not contribute to any meaningful impacts on habitat, they do not contribute to the habitat alteration and disturbance impacts caused by oil and gas development, timber harvesting, and other types of land uses.

The information and analysis in Chapter 4 herein and in Table 15 show that WS PDM activities have not contributed, and are not expected to contribute, to adverse effects on most of the wildlife species evaluated by BLM and USFS. A few species that WS affects directly by PDM such as coyotes and mountain lions (the affected environment) are further analyzed here for potential cumulative effects from BLM and USFS land management practices and decisions.

Regarding coyotes, a species directly affected by WS PDM activities, we found no mention of any concerns for the species in most BLM and USFS evaluations cited above. In one EIS (BLM 1999a) the BLM stated that small predators including coyotes would be impacted by oil and gas development because of habitat disturbance resulting in reductions of small mammal populations that are their primary source of prey. However, there is ample evidence in the scientific literature that coyote populations are not adversely impacted to any substantial degree by land management actions. Coyotes are one of the most successful, opportunistic and widely distributed predators in North America (Bekoff and Wells 1986). They have adapted to human land development (Howell 1982, Loven 1995), and have even expanded their range to more densely populated Eastern States over the past several decades (Hill et al. 1987, Moore and Parker 1992). Thus, it is doubtful that coyote populations have been negatively impacted to any significant degree by land management actions such as oil and gas development and timber harvesting and we are aware of no studies that show potential for significant effect on them by such activities. Moreover, oil and gas development does not typically eliminate enough vegetation or disturb a high enough percentage of the ground surface area to remove substantial amounts of small mammal habitat (BLM 1999a). Timber harvesting probably benefits coyotes by creating more open areas and "edge" habitats between wooded and open, early successional stage areas that are generally conducive to supporting a variety of small mammal species that would serve as coyote and other small carnivore prey. More importantly and with more relevance here, the analysis in section 4.1.1 herein shows that coyote populations in the State, as well as in the area of the State where a majority of WS's aerial hunting activities occur (northwestern Colorado), have been relatively stable and are expected to continue to be despite any cumulative effects from all types of activities (related or not related to WS PDM activities). Thus, there are no cumulatively significant impacts on the coyote population in Colorado (the primary component of the affected environment impacted by WS PDM).

One species that WS directly affects with PDM and that has been identified in at least one other agency's NEPA analysis as potentially being indirectly affected by oil and gas development is the mountain lion. For example, without explaining how or why, BLM (1991a) stated that potential significant impacts from oil and gas activities on mountain lion and black bear populations would most likely be restricted to localized areas. BLM (1999a) provided further explanation of potential effects on mountain lions and stated that indirect effects would be related to reductions in their principal prey species, primarily deer and elk, that result from any habitat loss that could occur as a result of oil and gas development. The most important type of habitat loss identified by BLM (1999a) was the loss of deer and elk winter range ¹⁵.

The analysis in Section 2.3.2 shows that mule deer numbers in Colorado have been stable for a number of years and have been increasing in a majority of areas of northwest CO where WS conducts the majority of its aerial hunting activity. Elk numbers have been increasing in most areas of the State and are substantially above CDOW's herd objectives in northwest CO. Therefore, it is evident that cumulative adverse impacts from all sources of stress on mule deer and elk populations have not been serious in recent years since populations on average are stable or increasing in the majority of herd unit areas and in the State overall. In areas where herds have declined or remain substantially below CDOW's herd objectives, drought, which results in poor forage availability to pregnant does and subsequent poor survival of fawns, is believed to be a major factor responsible (D. Finley, CDOW, pers. comm. 2005).

The above information provides evidence that cumulative impacts on deer and elk populations have not been serious since populations in most areas have been stable or are increasing and, in many areas, are above the long-term herd objectives of CDOW. This analysis shows there have not been any significant cumulative direct or indirect adverse impacts on deer and elk populations, which means mountain lions have not been directly or indirectly adversely affected

Harsh winters with deep snow are frequently limiting factors in deer and elk populations, and lower elevation areas where these species can find adequate forage to meet their survival energy needs and reproductive nutrition requirements are critical to maintaining desired population levels in many areas of the western U.S.

by reductions in their primary prey species.

In addition, as shown by the discussion in Section 2.3.2 herein, WS coyote removal activities that happen to occur on deer winter range areas could be having at least some positive or beneficial effect on deer by removing coyotes that can cause winter mortality or could otherwise cause added harassment stress on wintering deer (Mackie et al. 1976; Gese and Grothe 1995). On the Routt National Forest where WS conducts more PDM activity than on any other USFS managed area of the State, the USFS reports that elk and deer numbers are stable (USFS 2005). Therefore, WS PDM should not present any cumulative adverse impact concerns on mountain lion populations (the affected environment) as a result of indirect effects on their primary prey species since the current elk and deer population trends are stable to expanding (see section 4.1.1 for further analysis on direct mountain lion population impacts). Thus, there is no cumulatively significant impacts on the mountain lion population in Colorado (the affected environment).

2.3.5 Concerns that WS Employees Might Unknowingly Trespass

Public comments have raised the concern that WS employees could trespass onto private property or across State boundaries both on the ground or in the air. WS is well aware that it is sometimes difficult to determine land ownership in some areas, and WS field employees make diligent efforts to ensure that they do not enter properties where they do not have permission. Landowners who request assistance from WS typically provide WS representatives with very specific information not only about the property boundaries of their own land, but about the boundaries of neighboring lands as well. WS aerial hunting activities are typically conducted with the aerial crew in radio contact with a WS representative on the ground who knows the property boundaries of the area being worked. Therefore, we do not expect that inadvertent trespass incidents would rise to the level of presenting any significant environmental effects.

2.3.6 Potential Effects on Wildlife from the Mere Presence of WS Personnel Conducting PDM

Public comments have raised the concern that the mere presence of WS personnel in the field during the spring months has the potential to cause harmful disturbance to wildlife, and could potentially cause some animals to be separated from their mothers or might cause the abandonment of nest sites. Professional wildlife biologists believe there is no basis for this speculation, especially considering the short duration WS personnel spend in any particular area. There are fewer than 30 WS field personnel in Colorado, which is only a tiny fraction of many thousands of public recreationists and other public land users that go onto public lands in any one year as part of the existing human environment. WS abides by any area closures imposed by State or federal land or wildlife management agencies to protect sensitive wildlife species. We rely upon annual coordination with those same agencies to alert us to areas where this is of particular concern. In general, few if any such concerns have been raised by the responsible agencies because WS personnel only work in a small proportion of the land area and spend little time in any particular area.

2.3.7 Concerns that Killing Wildlife Represents "Irreparable Harm"

Public comments have raised the concern that the killing of any wildlife represents irreparable harm. Although an individual predator or multiple predators in a specific area may be killed by WS PDM activities, this does not in any way irreparably harm the continued existence of these species. Wildlife populations experience mortality from a variety of causes, including human harvest and depredation control, and have evolved reproductive capabilities to withstand considerable mortality by replacing individuals that are lost. Colorado's historic and current populations of big game animals, game birds, furbearers and unprotected predators, which annually sustain harvests of thousands of animals as part of the existing human environment, are obvious testimony to the fact that the killing of wildlife does not cause irreparable harm. Populations of some of these species are in fact much higher today than they were several decades ago (e.g. elk and mountain lions), in spite of liberal hunting seasons and the killing of hundreds or thousands of these animals annually. The legislated mission of CDOW is to preserve, protect, and perpetuate all the wildlife of the State. Therefore, CDOW would be expected to regulate killing of protected wildlife species in the State to avoid irreparable harm. Our analysis herein shows that the species WS takes in PDM actions are expected to sustain viable populations. Thus, losses due to human-caused mortality are not "irreparable."

2.3.8 Effects of Livestock Grazing on Riparian Areas and Wildlife Habitat as a "Connected Action" to WS's PDM Activities

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One public commentor has suggested that livestock grazing is "connected" to WS PDM action, which implies that it either is an "interdependent part" of WS PDM and depends on such PDM for its justification, that it is "automatically triggered" by WS PDM, or that it "cannot and will not proceed" unless WS PDM occurs (40 CFR 1508.25). All of these assertions are false.

Livestock grazing in Colorado occurs on many private property areas, as well as on about 98% of BLM and USFS identified grazing allotments, without any WS PDM actions conducted on those allotments in a given year. Therefore, livestock grazing is not automatically triggered by WS PDM, and it clearly can and does "proceed" in the absence of WS PDM assistance.

Some public commentors assert that WS PDM to protect livestock cannot or will not proceed unless livestock grazing is occurring. Obviously, such an assertion is nothing more than a tautology - if there were no raising of livestock at all in this country, then there would be no PDM activities to protect livestock. Of course, there would be no reason for WS to conduct PDM for livestock protection if there were no livestock to protect against predators, just like there would be no PDM actions if there were no predators of livestock. Normally, PDM activities will occur wherever livestock producers request PDM assistance whether it is on private land or on state or federal public lands and whether or not WS is specifically requested to do the PDM actions. Also, as we explain further below, PDM activities to protect livestock can and do occur, either privately and/or by assistance from State agencies, whether WS provides such assistance or not. Since federal agencies do not have the authority to regulate private land livestock grazing, such grazing and its effects are part of the existing human environment (i.e., "environmental status quo") and such private land livestock grazing is quite common and extensive.

As explained above, livestock grazing obviously does not occur and does not proceed because WS PDM occurs. Moreover, with respect to public lands (BLM and USFS), livestock grazing does not have to be occurring on such lands to potentially result in the occurrence of PDM activities on those lands for the purposes of protecting livestock. This is because predators oftentimes travel from an area of one land ownership where livestock are not present into an area of another land ownership where livestock are present to prey on the livestock. Therefore, there does not have to be any livestock grazing on BLM or FS lands to potentially still have some PDM activities on those lands for the purposes of protecting livestock on private lands that are in relative close proximity to or directly bordering on public lands.

The only livestock grazing activities that are subject to NEPA requirements are those that are authorized by federal land management agencies to occur on federal lands. The BLM and USFS prepare NEPA documents covering their authorizations of livestock grazing on federal public lands and we refer the reader to those agencies for further information and analysis of the environmental effects of grazing.

It is apparent that improperly controlled livestock grazing can lead to undesirable indirect effects on certain wildlife species by causing changes in rangeland habitat, including riparian areas. Regulation or restriction of livestock grazing is outside the scope of decisions that WS has authority to make. Thus, livestock grazing on all land ownership classes where it now occurs (private, State or Federal owned lands), and whatever impacts there might be from such grazing, are part of the environmental status quo whether or not WS conducts any PDM activities. As stated earlier, PDM methods used by WS have no direct effect on riparian areas, rangeland, or other types of habitat. Therefore, WS PDM activities do not contribute to any cumulative impact on riparian areas or other habitat areas that are being affected or have been affected by livestock grazing.

Although some persons may view WS PDM actions as causing "indirect" effects on rangeland and riparian areas by facilitating the continuation of livestock grazing in such areas, as discussed above, such livestock grazing does now take place and there is no reason to think it will not continue to take place, even without assistance from the WS program. For example, grazing occurs now on about 98% of the BLM and FS grazing allotments in the State without assistance from WS on those allotments. Thus, the overwhelming majority of livestock grazing activity on federal public federal

lands in Colorado is not receiving any WS PDM assistance and such grazing is part of the existing environmental status quo.

Federal laws governing the management of lands administered by the BLM and FS, including the National Forest Management Act (NFMA), Multiple Use and Sustained Yield Act of 1960, 16 U.S.C. § 528 (MUSYA), and Federal Land Policy Management Act, 43 U.S.C. § 1732(b) (FLPMA), require the BLM and FS to allow for and to manage livestock grazing on BLM and FS lands. For areas of federally designated wilderness under the jurisdiction of the BLM and FS, The Wilderness Act, Pub. L. 88-577, 78 Stat. 890, 16 U.S.C. §§ 1131 et seq., allows for the continuation of grazing operations in federally designated wilderness areas where grazing took place prior to the area's designation as wilderness. Thus, the BLM and FS, and not WS, have the authority to regulate and restrict grazing and to control the effects of grazing on riparian areas and on rangeland and forest wildlife habitat in general on federal public lands. No federal agency has authority to restrict livestock grazing on nonfederal lands.

As long as livestock producers experience serious economic losses from predators, some of them will continue to employ PDM actions to counter or prevent such losses whether or not WS continues to conduct PDM actions. It is evident that, in the absence of any involvement by WS, the livestock owners and managers and/or authorized State agencies will conduct predator damage management on their own. Currently, livestock producers that request WS PDM actions in Colorado must cover at least 50% of WS's costs for providing the PDM service. Even if some livestock producers went out of business from the lack of receiving any PDM assistance and thereby from losses resulting from significant predation, that does not mean that livestock grazing would not continue. Some such producers would be expected to sell their ranches, including, where applicable, any associated federal grazing permits, to other producers that may have better economic ability to withstand predation losses (e.g., the purchasing producer happens to have more cash to put toward the purchase and operating expenses and does not have to pay as much in financing costs to borrow funds - this means a better "bottom line" for the new producer and better financial ability to remain in business even with some levels of predation loss). However, it is also possible that other such producers that go out of business may sell their properties to land developers, which can then lead to reductions in wildlife habitat because of rural land subdivision and residential housing construction. When that occurs, the inability to obtain adequate PDM services could have the unintended consequence of leading to reductions in wildlife species that formerly lived on, or otherwise depended on, the habitat that was lost to development. Loss of habitat because of human population growth and expansion of housing into traditional habitat areas has been a major concern cited by CDOW in evaluating causes of long term declines in mule deer numbers since the middle part of the last century (Gill 1999).

Like livestock grazing and its impacts on the environment, PDM by nonfederal entities is part of the environmental status quo for the human environment in the absence of any federal PDM assistance and does not have to comply with the requirements and provisions of NEPA. However, such PDM actions by private or nonfederal parties could result in unacceptable and harmful impacts (USDA 1997). We believe it is reasonable to expect that professional assistance by a federal government agency operating under strict federal and state laws and government policies and guidelines is less likely to result in unintended adverse effects on the environment in general, and more specifically on nontarget wildlife and human health and safety than would private entities. Evidence exists to suggest some private entities are even likely to resort to illegal chemical pesticide uses in attempts to resolve real or perceived wildlife damage problems (USFWS 1996; Texas Department of Agriculture 2003; Porter 2004).

Moreover, PDM actions by private or nonfederal parties are not governed or restricted by all of the environmental laws by which federal government agencies are governed or restricted, such as NEPA and the "preventive measures" consultation requirements of Section 7 of the ESA. Thus, curtailing or greatly restricting WS PDM assistance could lead to the unintended but real and significant effect of greater adverse environmental impacts caused by private or nonfederal parties performing PDM actions. It is apparent that, at least with respect to federal public lands, livestock grazing is regulated with the goal of reducing the severity of adverse impacts on wildlife and other environmental resources (see BLM and FS EIS documents listed in the References section herein), just like WS takes into account the impacts on wildlife and other environmental resources by its PDM actions.

It is certainly reasonable to assume that PDM by State or private entities would occur in the absence of assistance by WS.

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This means that even if someone asserts that WS PDM for livestock protection is "connected" to public land grazing, WS has no ability to affect the environmental outcome because most such grazing will continue to occur on public lands anyway, and at least some level of PDM will most likely occur also, in the absence of any action by WS. Thus, even if WS decided to select a "no WS program" alternative, such a decision would have virtually no meaningful effect in changing the environmental status quo with respect to the impacts of grazing and/or PDM actions. The federal land management laws described above (NFMA, MUSYA, FLPMA, and Wilderness Act) all contain clauses protecting the rights of the States to maintain jurisdiction over the management of resident wildlife species. ¹⁶ It is our understanding that, unless regulated or restricted by the BLM or FS, authorized Colorado State agencies such as the CDOW and CDA (or even private entities acting in accordance with State wildlife laws) could theoretically be authorized to control predators on BLM and FS lands in the absence of any involvement by WS.

2.3.9 Impacts of Predator Removal on the Public's Aesthetic Enjoyment of Predators

Wildlife is generally regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Some members of the public have expressed concerns that PDM could result in the loss of aesthetic benefits to the public, resource owners, or local residents. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful.

WS PDM activities occur on a relatively limited portion of the total area in Colorado, and the portion of various predator species' populations removed through WS PDM activities is typically low (see Chapter 4). In localized areas where WS removes some portion of the predator population, dispersal of predators from adjacent areas typically contributes to repopulation of the area within a few weeks to a year, depending on the level of predator removal and predator population levels in nearby areas. Most of the species potentially affected by WS PDM activities are relatively abundant, but are not commonly observed because many of these species are secretive and nocturnal. The likelihood of getting to see or hear a predator in some localized areas could be temporarily reduced as a result of WS PDM, but because there is already a low likelihood of seeing a predator, this temporary local reduction in public viewing opportunity would not likely be noticeable in most cases. Impacts of WS PDM on overall predator populations would be relatively low under any of the alternatives being considered in this EA, and opportunities to view, hear, or see evidence of predators would still be available over the vast majority of public land areas of the State since WS conducts PDM on a small percentage of BLM and FS lands.

2.3.10 Livestock Losses Are a Tax "Write Off"

Some people believe that livestock producers receive double benefits because producers have a partially tax funded program to resolve predation problems while they also receive deductions for livestock lost as a business expense on tax returns. However, this notion is incorrect because the Internal Revenue Service tax code (Internal Revenue Code, Section 1245, 1281) does not allow for livestock losses to be "written off" if the killed livestock was produced on the ranch. About 77% of predation occurs to young livestock (lambs, kids, and calves) in Colorado. Additionally, many ewes, nannies, and cows added as breeding stock replacements to herds from the lamb, kid, and calf crop, and if lost to predation they cannot be "written off" since they were not purchased. These factors limit the ability of livestock producers to recover financial losses. This analysis clearly shows that producers do not receive double benefits from having a federal program to manage wildlife damage and collect federal tax deductions for predation losses.

Multiple Use and Sustained Yield Act of 1960, 16 U.S.C. § 528 ("MUSYA") (stating that nothing in the act "shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish on the national forests"); Federal Land Planning Management Act, 43 U.S.C. § 1732(b) (emphasizing that "nothing in this Act shall be construed as * * * enlarging or diminishing the responsibility and authority of the States for management of fish and resident wildlife"). The National Forest Management Act of 1976 explicitly incorporated the MUSYA. 16 U.S.C. § 1604(e)(1). The Wilderness Act provides that "nothing in this Chapter shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish in the national forests." 16 U.S.C. § 1133(d)(7).

2.3.11 American Indian and Cultural Resource Concerns

The National Historic Preservation Act of 1966, as amended, requires federal agencies to evaluate the effects of any federal undertaking on cultural resources and determine whether they have concerns for cultural properties in areas of these federal undertakings. In most cases as discussed in Section 1.7.2, WDM activities have little potential to cause adverse affects to sensitive historical and cultural resources. If an individual PDM activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

The Native American Graves and Repatriation Act of 1990 provides protection of American Indian burials and establishes procedures for notifying Tribes of any new discoveries. Senate Bill 61, signed in 1992, sets similar requirements for burial protection and Tribal notification with respect to American Indian burials discovered on state and private lands. If a burial site is located by a WS employee, the appropriate Tribe or official would be notified. PDM activities will only be conducted at the request of a Tribe or their lessee and, therefore, the Tribe should have ample opportunity to discuss cultural and archeological concerns with WS. However, in consideration of Colorado's Native Americans, WS has included all of the recognized Tribes in Colorado on the mailing list for this EA to solicit their comments.

2.3.12 Impacts on the Natural Environment Not Considered

WS's PDM activities have been evaluated for their impacts on several other natural environmental factors. USDA (1997) concluded that impacts on air quality from the methods used by WS are considered negligible. In addition, the proposed action does not include construction or discharge of pollutants into waterways and, therefore, would not impact water quality or require compliance with related regulations or Executive Orders. The proposed action would cause only very minimal or no ground disturbance and, therefore, would impact soils and vegetation insignificantly.

2.3.13 Appropriateness of preparing an EA for such a large area, rather than preparing multiple EAs covering individual counties in a state.

The determination of the relevant geographical region to be covered by an EA falls within the informed discretion and expertise of the agency responsible for conducting the proposed action. (*Kleppe v. Sierra Club*, 427 U.S. 390, 414 (1976)). We have considered both the proposed action and the geographic area involved and have determined that the preparation of this EA to address WS' PDM activities on a statewide basis for the state of Colorado is the appropriate approach to take. Moreover, if in fact a further determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. We believe we have appropriately, effectively and adequately covered all the direct and indirect impacts as well as the site-specific and cumulative effects issues related to WS' PDM actions in Colorado within this statewide document. Accordingly, there is no need to prepare multiple EAs covering individual counties in this state.

2.3.14 The Relationship Between Predators and Rodent and Rabbit (Microherbivore) Populations

Rabbit and rodent populations normally fluctuate substantially in several-year cycles. Two hypotheses attempt to explain these cyclic fluctuations: 1) rodent and rabbit populations are self-regulated through behavior, changes in reproductive capacity due to stress, or genetic changes (Chitty 1967, Myers and Krebs 1971), 2) populations are regulated by environmental factors such as food and predation (Pitelka 1957, Fuller 1969).

Keith (1974) concluded that: 1) during cyclic declines in prey populations, predation has a depressive effect and as a result, the prey populations may decline further and be held for some time at relatively low densities, 2) prey populations may escape this low point when predator populations decrease in response to low prey populations, and 3) since rabbit and rodent populations increase at a faster rate than predator populations, factors other than predation must initiate the decline in populations.

Chapter 2

Wagner and Stoddart (1972) and Clark (1972) independently studied the relationship between coyote and black-tailed jackrabbit populations in northern Utah and southern Idaho. Both concluded that coyote populations seemed to respond to an abundance of jackrabbits. When a broad range of prey species is available, coyotes will generally feed on all species available; therefore coyote populations may not vary with changes in the availability of a single prey species (Knowlton 1964, Clark 1972).

Wagner (1988) reviewed literature on predator impacts on prey populations and concluded that such impacts vary with the locale. In some ecosystems, prey species such as snowshoe hares increase to the point that vegetative food sources are depleted despite predation. In others, e.g., jackrabbits in the Great Basin, coyotes may limit jackrabbit density and evidence indicates food shortages do not occur to limit jackrabbit abundance. Wagner and Stoddart (1972) reported that coyote predation was a major source of jackrabbit mortality and may have caused a decline in jackrabbit numbers in the Curlew Valley in Utah.

In general, it appears that predators prolong the low points in rodent population cycles and spread the duration of the peaks. Predators generally do not "control" rodent populations (Keith 1974, Clark 1972, Wagner and Stoddart 1972). It is more likely that prey abundance controls predator populations. The USFWS (1979, p. 128) concluded that "WS Program activities have no adverse impacts to populations of rodents and lagomorphs." The USDA (1997) did not specifically deal with this issue.

Henke (1995) reviewed literature concerning coyote-prey interactions and concluded that short term (\leq 6 months per year) coyote removal efforts typically do not result in increases in small mammal prey species populations, but that longer term intensive coyote removal (9 months or longer per year) can in some circumstances result in changes in rodent and rabbit species composition which may lead to changes in plant species composition and forage abundance. The latter conclusion was based on one study (Henke 1992) which was conducted in the rolling plains area of Texas that involved one year of pretreatment and two years of treatment. Whether such changes would occur in all ecosystems in general remains to be proven. Assuming that such changes do nevertheless occur in general, the following mitigating factors should serve to minimize these types of environmental impacts:

- 1. Most PDM actions in localized areas of the State would not be year round but would occur for short periods after damage occurs (corrective control situations) or for short periods (90-120 days) at the time of year when benefits are most likely such as the period of time immediately preceding and during calving and lambing in the spring.
- 2. WS would conduct PDM on properties that comprise less than 4% of the land area of the State and would kill a low percentage (< 5%) of the area population of coyotes in any one year means ecosystem impacts from WS actions should be low in magnitude.
- 3. Take of other carnivores that prey on rodents and rabbits is too low to indicate any potential for a significant effect. Evidence also exists to suggest other carnivores such as badgers, bobcats, and foxes increase in number when coyote populations are reduced (Robinson 1961, Nunley 1977). Therefore, even if coyote numbers were reduced substantially in a localized area, other species that prey on rodents and rabbits would probably increase in number to naturally mitigate some reduction in coyote predation on those prey species that might occur.

Other prey species of coyotes include white-tailed and mule deer, and pronghorn antelope. Information presented in Chapter 1 indicates that local short term predator population reductions may enhance deer and antelope populations. This could be either a beneficial or detrimental effect depending upon whether local deer populations were at or below the capacity of the habitat to support them. However, as stated above, since WS would only conduct PDM on less than 4% of the land area of the State and would take less than 5% of the coyote population in any one year, it is unlikely that positive effects on deer or antelope populations would be significant, except in isolated instances. If CDOW or an Indian tribe requested coyote removal for the purpose of enhancing antelope or deer herds, an increase in local populations would be desired and considered a beneficial impact on the human environment. In those situations, it is likely that

coyote control would be ended when herd management goals have been met. In any event, it is unlikely that impacts would be significant in major portions of the State under the current program.

2.3.15 Effectiveness, including Cost Effectiveness, of WS PDM

Public commentors have expressed a concern that lethal PDM methods are not effective in reducing livestock losses. Although it is impossible to accurately determine the amount of livestock PDM saves from predation, it can be estimated. Scientific studies have revealed that in areas without some level of PDM, losses of adult sheep and lambs to predators can be as high as 8.4% and 29.3% of the total number of head, respectively (Henne 1977, Munoz 1977, O'Gara et al. 1983). Conversely, other studies have indicated that sheep and lamb losses are generally lower where PDM is applied (Nass 1977, Tigner and Larson 1977, Howard and Shaw 1978, Howard and Booth 1981). Although these studies were not specifically designed to determine the difference in losses that occur with vs. without PDM on the properties studied, they are the best information available for estimating such a difference. The effectiveness of WS can also be measured by public satisfaction with the PDM program. In a survey that Policy and Program Development of APHIS conducted, it was determined that the satisfaction of the people assisted with WDM by the WS program nationwide was very high (APHIS 1994).

The current program alternative was compared with the other alternatives in USDA (1997) and it was concluded to be the most effective of the alternatives considered. In evaluating cost effectiveness of PDM, the ADC programmatic EIS concluded that benefits, in terms of avoided sheep and lamb losses plus price benefits to consumers, are 2.4 times the cost of providing WS PDM services for sheep protection in the 16 western states (USDA 1997). Schwiff and Merrill (2004) reported 5.4% increases in numbers of calves brought to market when coyotes were removed by aerial hunting. Bodenchuk et al. (2003) reported predation management benefit-cost ratios of 3:1 up to 27:1 for agricultural resource protection. Wagner and Conover (1999) found that total lamb losses declined 25% on grazing allotments in which coyotes were removed by winter aerial hunting 5-6 months ahead of summer sheep grazing, whereas total lamb losses only declined 6% on allotments that were not aerial hunted. Confirmed losses to coyotes declined by 7% on aerial hunted allotments, but increased 35% on allotments receiving no aerial hunting (Wagner and Conover 1999). Therefore, there is considerable evidence that PDM, including aerial hunting, is effective, as well as cost effective. CEQ regulations (40 CFR 1502.23) do not require a formal cost-benefit analysis to be in compliance with NEPA.

2.4 ISSUES NOT CONSIDERED BECAUSE OUTSIDE THE SCOPE OF THIS ANALYSIS

WS often receives public comments identifying issues that are outside the scope of analysis relevant for this EA. A number of these are included here.

- How the WS program is funded.
- The Act of March 2, 1931 should be repealed.
- WS exacerbates coyote damage problems by killing off rodents and rabbits so they do not have adequate supplies of natural prey.
- Appropriateness of livestock grazing on public lands.
- Appropriateness of fees for public lands grazing.
- Riparian damage caused by livestock grazing.
- WS services should not be provided to property owners who restrict public access to their lands.
- Impacts of grazing, fires, and noxious weeds on wildlife habitat.

- Future potential wolf reintroduction throughout the State.
- WS has no formal appeals process.
- Road closures to the public restrict access to private trappers.
- Habitat management should be studied as a way to increase wildlife populations.
- Human overpopulation.
- Impacts of non-WS related disturbances such as development of water sources, livestock grazing and herding, agricultural activities, hiking, fishing, horseback riding, and sightseeing activities.
- Reduction or elimination of wildlife hunting seasons should be considered as an alternative to reducing predator populations for protection of wildlife.

CHAPTER 3: ALTERNATIVES

WS's alternatives must encompass the varied and diverse needs of PDM and be applicable throughout Colorado. The varied nature and diversity of requests for PDM assistance requires WS to be diverse, dynamic, and flexible. USDA (1997) developed 13 possible alternatives. Five of the alternatives were determined to be relevant by WS, cooperating agencies, and the public for conducting PDM activities in Colorado. These alternatives were considered in previous EAs (WS 1997b, 1999a): 1) Continue the current Federal PDM program, the Proposed Action; 2) No Federal PDM program; 3) Technical Assistance only; 4) Nonlethal required before lethal control; and 5) Corrective control only when lethal PDM methods are used. This EA will revisit these alternatives for consideration.

3.1 ALTERNATIVES ANALYZED IN DETAIL

3.1.1 Alternative 1 - Modified Current Program, the "Proposed Alternative"

This is the "No Action" alternative as defined by CEQ for ongoing programs. This alternative would allow the current program to continue as conducted under the existing Western Colorado and Eastern Colorado EAs (WS 1997b, 1999a, 2001). However, a statewide EA would replace the Eastern and Western Colorado EAs. WS would continue to provide PDM statewide within the scope of the analysis herein.

3.1.2 Alternative 2 - No Federal WS PDM

This alternative consists of no Federal PDM assistance in Colorado.

3.1.3 Alternative 3 - Technical Assistance Only

Under this alternative, WS would provide advice or guidance on PDM techniques and methods, but would not conduct any direct operational PDM when attempting to assist in resolving damage complaints.

3.1.4 Alternative 4 - Nonlethal Required before Lethal Control

This alternative would require that resource owners use nonlethal techniques prior to WS implementing lethal PDM methods to resolve a damage problem.

3.1.5 Alternative 5 - Corrective Control Only When Lethal PDM Methods are Used

This alternative would require that livestock depredation or other resource damage by predators must have occurred before the initiation of lethal control. No preventive lethal PDM would be allowed.

3.2 DESCRIPTION OF THE ALTERNATIVES

3.2.1 Alternative 1 - Continue the Current Federal PDM Program

The "No Action" alternative is a procedural NEPA requirement (40 CFR 1502.14(d)), and is a viable and reasonable alternative that could be selected. It serves as a baseline for comparison with the other alternatives and, as a result, receives an in depth analysis. In this EA, the "No Action" alternative is consistent with CEQ's definition and is equivalent to the current program as conducted under the two existing EAs and supplement (WS 1997b, 1999a, 2001). These are being combined into one EA to ensure that PDM is consistent statewide. The analysis of impacts is preferable at the statewide level because estimates are used for predator species populations and most harvests which are statistically more reliable at this, broader level. This EA reflects the descriptions, restrictions, and SOPs found within the existing WS EAs, including their accompanying "Findings of No Significant Impacts" (FONSI) and "Records of Decision" (ROD) (WS 1997b, 1999a) and new FONSI/ROD for the Western Colorado EA (WS 2001). The 2 EAs represented 2 separate analyses on possible environmental impacts of the WS Program in eastern and western Colorado. They

resulted in nearly identical FONSIs and RODs. As a result of no significant impact in eastern and western Colorado, to keep WS PDM consistent at the statewide level, and because monitoring PDM effects on wildlife populations is best at the statewide level (matches CDOW data which is estimated and statistically most reliable at the statewide level), WS has determined that one statewide EA would adequately address issues and concerns relevant to Colorado. Additionally, this EA contains new SOPs initiated to minimize issues that have arisen since the existing EAs were written.

Under the current program, the majority of requests for PDM, about 90%, come from livestock and other agricultural producers associated with both private and public lands. WS also receives requests for PDM assistance to protect property, natural resources, and human health and safety. Most of these requests come from private individuals. Some requests come from public entities such as county and state governmental agencies or Tribes. WS provides PDM assistance to livestock and other resource owners within the fiscal constraints of the program. The current PDM program on private lands is governed by WS policy and a specific private property agreement for that particular property specifying methods to be used and species to be targeted. While the majority of livestock owners are based on private land, many of them graze their livestock on or adjacent to public lands for some portion of the year. These livestock can encounter depredation from predators that originate from the public lands. PDM provided by WS personnel can be conducted on public, private, state, Tribal, and other lands, or any combination of these land class types where agreements for PDM are in place.

Current program activities on federal administered and owned lands (BLM and USFS) are defined specifically in WPs and WS follows all laws and regulations that have been determined to apply to PDM on these lands. WS provides information on proposed PDM activities to the cooperating agencies (BLM, USFS, CDOW). These agencies are responsible for reviewing proposed actions to assess their compatibility with established RMPs or LRMPs. It is the land management agency's responsibility to clearly show where a proposed action would likely conflict with land use plans. Maps are used to delineate areas where PDM restrictions or limitations are needed to avoid conflicts with land uses. The WP and WS Decision Model (Slate et al. 1992) provide further site specific planning mechanisms to evaluate and monitor PDM activities for a given area.

- 3.2.1.1a Planned Control Areas. Planned control areas are areas where WS is actively working or plans to work to limit predator damage. Planned activities are those which are anticipated to occur based on historical needs. However, PDM may or may not be conducted in these areas because needs vary from year to year and site to site. Since WS cannot actually predict where losses are going to occur and where livestock are going to be grazed. PDM is most concentrated in areas where livestock are most abundant and during times when they are most vulnerable to predators (e.g. during calving and lambing). Requests for assistance in reducing property damage and threats to human health and safety are by their nature, intermittent and, thus, far less predictable.
- **3.2.1.1b** Unplanned/Emergency Control Areas. Unplanned and emergency PDM may be provided in areas where no PDM is scheduled with the exception of areas designated as restricted. The restricted zones are identified by WS, cooperators, or cooperating agencies. These areas, if not well known (i.e., a well known area may not need to be described such as *Trailhead X* or *Campground Y*), are often noted using a color scheme in WP maps and, therefore, these areas can be avoided as need be. Where unanticipated local damage problems arise that threaten human health and safety or property, WS may take immediate action to eliminate or curtail the problem provided the proposed control area is not located within a designated restricted activity zone. Emergency PDM activities are handled on a case-by-case basis, as the need arises. WS notifies the cooperating agency as soon as practicable after the emergency action commences or the work is performed.
- 3.2.1.2 IWDM. WS has been conducting WDM in the United States for more than 85 years. WS has modified WDM activities to reflect societal values and minimize impacts to people, wildlife, and the environment. The efforts have involved research and development of new field methods and the implementation of effective strategies to resolve wildlife damage. The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. IWDM is the implementation and application of safe and practical methods for the prevention and control of damage caused by wildlife based on local problem analyses and the informed judgement of trained personnel; this is the application of PDM by WS Specialists (WS Directive 2.105) to reduce damage through the

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WS Decision Model (Slate et. al. 1992) described in USDA (1997) and Section 1.5.5.

The philosophy behind IWDM is to implement effective management techniques in a cost effective manner while minimizing potentially harmful effects on humans, target and nontarget species, and the environment. IWDM draws from the largest possible array of options to create a combination of techniques appropriate for the specific circumstances. IWDM may incorporate cultural practices (i.e., animal husbandry), habitat modification, animal behavior (i.e., scaring), local population reduction, or any combination of these, depending on the characteristics of the specific damage problems. USDA (1997) describes the procedures used by WS personnel to determine management strategies or methods applied to specific damage problems. As depicted in the Decision Model (Figure 3), consideration is given to the following factors before selecting or recommending control methods and techniques:

- Species responsible for damage
- Magnitude, geographic extent, frequency, and duration of the problem
- Status of target and nontarget species, including T&E species
- Local environmental conditions
- Potential biological, physical, economic, and social impacts
- Potential legal restrictions
- Costs of control options
- Prevention of future damage (lethal and nonlethal techniques)

WS personnel provide information, demonstrations, and advice on available PDM techniques. Technical assistance includes demonstrations on the proper use of some management devices and information on animal husbandry, wildlife habits, habitat management and animal behavior modification. Technical assistance is generally provided following an on-site visit or verbal consultation with the requestor. Generally, several management strategies are described to the requestor for short and long-term solutions to damage problems. These strategies are based on the level of risk, need and practical application. Technical assistance recommendations do not constitute a federal action other than giving people advice on methods that could be used to resolve a problem.

Operational damage management assistance is implemented when the problem cannot be resolved through technical assistance. The initial investigation defines the nature and history of the problem, extent of damage, and the species responsible for the damage. Professional skills of WS personnel are often required to resolve problems effectively, especially if restricted pesticides are proposed or if the problem is complex. WS considers the biology and behavior of the damaging species and other factors using the WS Decision Model (Slate et al. 1992). The recommended strategy(ies) may include any combination of preventive and corrective actions that could be implemented by the requester, WS, or other agency personnel, as appropriate. These strategies are preventive or corrective in character.

Preventive Damage Management is applying PDM strategies before damage occurs, based on historical problems and data. Most nonlethal methodologies, whether applied by WS or resource owners, are employed to prevent damage from occurring. For example, fencing is often used to keep wildlife such as predators out of livestock pastures and prevent damage from occurring. Unfortunately, many nonlethal PDM techniques are only effective for a short time before wildlife habituate to them (Pfeifer and Goos 1982, Conover 1982) and are generally only practical for small areas (Arhart 1972, Rossbach 1975, Shirota et al. 1983, Schmidt and Johnson 1984, Mott 1985, Dolbeer et al. 1986, Graves and Andelt 1987, Tobin et al. 1988, Bomford 1990). When requested, WS personnel provide information and conduct demonstrations, or take action to prevent additional losses from recurring. For example, in areas where substantial lamb or calf depredations have occurred on lambing or calving grounds historically, WS may provide information about livestock guarding animals, fencing or other husbandry techniques, or if requested and appropriate, conduct PDM before lambing or calving begins. The rationale for conducting preventive damage management to reduce damage differs little in principle from holding controlled hunts for deer or elk in areas where agricultural damage has been a historical problem. By reducing the number of deer near agricultural fields, or the number of coyotes near a herd of sheep or before sheep begin grazing in an area (Wagner 1997), the likelihood of damage can be reduced.

Corrective Damage Management is applying PDM to stop or reduce current losses. As requested and appropriate, WS

personnel in Colorado provide information, conduct demonstrations, or take action to prevent additional losses. For example, in areas where verified and documented lamb depredations are occurring, WS may provide information about livestock guarding animals, fencing or husbandry techniques, or conduct operational damage management to stop the losses. The U.S. General Accounting Office (1990) concluded that, according to available research, localized lethal damage management is effective in reducing predator damage.

Methods Available for Use

A wide range of methods are used by WS personnel in PDM and strategies are based on applied IWDM principles. WS employs or recommends three general strategies to reduce wildlife damage: resource management, physical exclusion, or wildlife management. Each of these approaches represents a general strategy or recommendation for addressing wildlife damage situations. Within each approach, specific methods or tactics are available for PDM, including many that are specific to individual species. Technical assistance may include providing advice, information, recommendations, and materials to others for use in resolving wildlife-caused damage. Assistance is most often provided for use of PDM methods associated with resource management and physical exclusion PDM methods, and potentially a few wildlife management techniques such as harassment and cage traps. This may require on-site instruction on the use of some PDM techniques (for example harassment techniques). WS operational damage management efforts can include any of the PDM methods, but primarily involve site-specific "hands-on" wildlife management techniques that are difficult for much of the public to implement or involve safety concerns when being implemented by the public.

WS in Colorado uses or recommends a wide variety of methods for PDM. Some techniques suggested for use by resource owners, by other entities or individuals, to stop predator damage may not be considered by WS if they are biologically unsound, legally questionable, or ineffective.

Detailed Description of Methods Used by Colorado WS in PDM

Following is a list of methods considered by WS for PDM and a discussion of their use.

Resource Management

- Habitat Management
- Animal Husbandry Techniques
- Guard Animals
- Modification of Human Behavior

Physical Exclusion

- Fencing
- Netting

Wildlife Management

- Frightening Devices
- Chemical Repellents
- Capture Methods (lethal and nonlethal)
- Immobilization/Euthanasia
- Chemical Medications
- Chemical Toxicants

Resource Management

Resource management includes a variety of practices that may be used by agriculture producers and other resource owners to reduce their exposure to potential predator depredation losses. Implementation of these practices is appropriate when the potential for depredation can be reduced without increasing the cost of production significantly or diminishing the resource owner's ability to achieve land management and production goals. Changes in resource management are usually not conducted operationally by WS, but usually implemented by producers. Many of these techniques can require the producer to devote significant time and initial expense towards implementing, but can be very

effective (Knowlton et al. 1999, Conover 2002, Mitchell et al. 2004). WS could assist producers in implementing changes to reduce problems. WS has the potential for using the following techniques in PDM.

Habitat Management. Localized habitat management is often an integral part of PDM. The type, quality, and quantity of habitat are directly related to the wildlife produced or attracted to an area. Habitat can be managed to not produce or attract certain wildlife species. Habitat management is typically aimed at eliminating cover used by particular predators at specific sites. Limitations of habitat management as a method of reducing predator damage are determined by the characteristics of the species involved, the nature of the damage, economic feasibility, and other factors. Legal constraints may also exist which preclude altering particular habitats. Most habitat management recommended by WS in PDM is aimed at reducing wildlife aircraft strike hazards at airports (i.e., managing brush and grass cover at airports to reduce field rodent populations which are a prey-base attractant) or reducing cover for predators near lambing or calving pens and grounds to reduce predation. The last is particularly important in PDM because predators are more likely to be successful if the area is conducive to ambush or allows the predator to approach the prey species under the cover of dense brush. Removal or thinning of the brush can discourage predator activity. Also, opening the area allows for better monitoring and increases the value of shooting. WS provides recommendations at airports to modify the habitat, but generally does not engage in habitat management directly. WS generally does not modify habitats nor recommend any sort of habitat modifications in T&E species habitat.

Animal Husbandry Techniques. This general category includes modifications in the level of care and attention given to livestock, shifts in the timing of breeding and births, selection of less vulnerable livestock species to be produced, and the introduction of human custodians (herders) to protect livestock. The level of care or attention given to livestock may range from daily to seasonal. Generally, as the frequency and intensity of livestock handling increase, so does the degree of protection (Robel et al. 1981). In operations where livestock are left unattended for extended periods, the risk of depredation is greatest. The risk of depredation can be reduced when operations permit nightly gathering so livestock are unavailable during the hours when predators are most active. It also possible to reduce predation of sheep by concentrating sheep in smaller areas (Sacks and Neale 2002). Additionally, the risk of depredation is usually greatest with immature livestock. This risk diminishes as age and size increase and can be minimized by holding expectant females in pens or sheds to protect births and by holding newborn livestock in pens for the first 2 weeks. Shifts in breeding schedules can also reduce the risk of depredation by altering the timing of births to coincide with the greatest availability of natural prey to predators or to avoid seasonal concentrations of predators. The use of herders can also provide some protection from predators, especially those herders accompanying bands of sheep on open range where they are highly susceptible to predation.

Guard Animals. Guard animals are used in PDM to protect a variety of resources, primarily livestock, and can provide adequate protection at times. Guard animals (i.e., dogs, burros, and llamas) have proven successful in many sheep and goat operations. The effectiveness of guarding animals may not be sufficient in areas where there is a high density of wildlife to be deterred, where the resource (sheep foraging on open range) is widely scattered, or where the guard animal to resource ratios are less than recommended. In addition, some guard animals intended for protection against small to medium size predators like coyotes may be prey to larger predators like mountain lions and black bears. Colorado WS often recommends the use of guard dogs, but does not have an operational guard dog program.

Modification of Human Behavior. WS often tries to alter human behavior to resolve potential conflicts between humans and wildlife. For example, WS may talk with residents of an area to eliminate the feeding of wildlife that occurs in parks, recreational sites, or residential areas to reduce damage by certain predators such as coyotes and bears. This includes inadvertent feeding allowed by improper disposal of garbage or leaving pet food outdoors where wildlife can feed on it. Many wildlife species adapt well to human settlements and activities, but their proximity to humans may result in damage to structures or threats to public health and safety. Eliminating wildlife feeding and handling can reduce potential problems. However, many people who are not directly affected by problems caused by wildlife enjoy wild animals and engage in activities that encourage their presence.

Another example of human behavior modification consists of assisting people that have a fear of an animal. WS receives calls about species such as large carnivores that are not causing damage. Their mere presence is perceived as a threat

to the callers even though the animal is in its natural habitat. WS personnel provide educational information and reassurance about these species.

Physical Exclusion

Physical exclusion methods restrict the access of wildlife to resources. These methods can provide effective prevention of wildlife damage in many situations.

Fencing. Fences are widely used to prevent damage from predators. Exclusionary fences constructed of woven wire or multiple strands of electrified wire can be effective in keeping predators from some areas such as an airport. The size of the wire grid and height of the fence must be able to keep the predators out. In addition, an underground apron (i.e., fencing in the shape of an "L" going outward) about 2 feet down and 2 feet out helps make a fence more wildlife proof; the "L" keeps predators out that dig crawl holes under the fence. However, fencing has limitations. Even an electrified fence is not always wildlife-proof and the expense of the fencing can often exceed the benefit. In addition, if large areas are fenced, the wildlife being excluded has to be removed from the enclosed area to make it useful. Some fences inadvertently trap, catch or affect the movement of nontarget wildlife and may not be practical or legal in some areas (e.g. restricting access to public land).

Netting. Netting consists of placing wire nets (chicken wire-mesh) or heavy duty plastic, around or over resources, likely to be damaged or that have a high value. Netting is typically used to protect areas such as livestock pens, fish ponds and raceways, and structures. Complete enclosure of ponds and raceways to exclude all predatory wildlife such as minks and raceons typically requires wire mesh secured to frames or supported by overhead wires. Gates and other openings must also be covered. Complete enclosure of areas with netting can be very effective at reducing damage by excluding all problem species, but can be costly.

Wildlife Management

Reducing wildlife damage through wildlife management is achieved through the use of many techniques. The objective of this approach is to alter the behavior of or repel the target species, remove specific individuals from the population, reduce or suppress local population densities, or extirpate exotic species populations to eliminate or reduce the potential for loss or damage to resources.

Frightening Devices. Frightening devices are used to repel predators from an area where they are a damage risk (i.e., airport, livestock bedding areas). The success of frightening methods depends on an animal's fear of, and subsequent aversion to, offensive stimuli (Shivak and Martin 2001). A persistent effort is usually required to effectively apply frightening techniques and the techniques must be sufficiently varied to prolong their effectiveness. Over time, animals often habituate to commonly used scare tactics and ignore them (Dolbeer et al. 1986, Graves and Andelt 1987, Bomford 1990). In addition, in many cases animals frightened from one location become a problem at another. Scaring devices, for the most part, are directed at specific target species and operated by private individuals or WS Specialists working in the field. However, several of these devices, such as scarecrows and propane exploders, are automated.

Harassment and other methods to frighten animals are probably the oldest methods of combating wildlife damage. These devices may be either auditory or visual and provide short-term relief from damage. A number of sophisticated techniques have been developed to scare or harass wildlife from an area. The use of noise-making devices (electronic distress sounds, alarm calls, propane cannons, and pyrotechnics) is the most popular. Other methods include harassment with visual stimuli (e.g. flashing or bright lights, scarecrows, human effigies, balloons, mylar tape, wind socks), vehicles, or people. Some methods such as the Electronic Guard use a combination of stimuli (siren and strobe light). These are used to frighten predators from the immediate vicinity of the damage prone area. As with other PDM efforts, these techniques tend to be more effective when used collectively in a varied regime rather than individually. However, the continued success of these methods frequently requires reinforcement by limited shooting (see Shooting).

Other frightening methods in use are rubber bullets and "bean bags" that are shot from shotguns. Rubber bullets and

bean bags do not kill or pass through an animal, but are intended to hurt them enough to avoid a particular activity again. Rubber bullets and bean bags have been used mostly for nuisance predators (i.e., "garbage can bears"). When a predator associates being shot with raiding a garbage can or other nuisance activity, it is hoped that they will avoid that activity in the future. Rubber bullets or bean bags are used target-specifically.

Chemical Repellents. Chemical repellents are nonlethal chemical formulations used to discourage or disrupt particular wildlife behaviors. Chemical repellents are categorized by their delivery mechanism: olfactory, taste, and tactile. Olfactory repellents must be inhaled to be effective. These are normally gases, or volatile liquids and granules, and require application to areas or surfaces that need protecting. Taste repellents are compounds (i.e., liquids, dusts, granules) that are normally applied to trees, shrubs, and other materials that are likely to be eaten or gnawed by the target species. Tactile repellents are normally thick, liquid-based substances which are applied to areas or surfaces to discourage travel of wildlife by causing irritation such as to the feet. Most repellents are ineffective or are short-lived in reducing or eliminating damage caused by wildlife. These are infrequently used by WS. The only repellents available for predators are unrestricted chemicals such as tobacco dust (i.e., F&B Rabbit and Dog Chaser®) and capsaicin from hot pepper (i.e., Hot Sauce®, Miller®) that are sold over-the-counter to the general public to repel dogs and cats from areas where they are not wanted (i.e., flower beds, gardens). Colorado WS has not used any repellents in PDM and does not anticipate their use. Additionally, chemical repellents for the most part are nontoxic to the intended target species, nontargets, and the environment.

Capture or Take Methods. Several methods are available to capture or take offending predators. The appropriateness and efficacy of any technique will depend on a variety of factors.

Leghold Traps are versatile and used by WS in Colorado for capturing many species on private lands. These traps can be used to live-capture a variety of animals and are frequently used by WS to capture most predators in Colorado. These are frequently used by WS to capture most all predators. Traps placed in the travel lanes of the targeted animal, using location to determine trap placement rather than attractants, are known as "blind sets." More frequently, traps are placed as "baited" or "scented" sets. These trap sets use an attractant consisting of visual attractants (e.g. feathers) or food bases, such as fetid meat, urine, or musk, to attract the animal. In some situations a "draw station," such as a carcass, animal parts, or a large piece of meat, is used to attract target predators. In this approach, one to several traps are placed in the vicinity of the draw station. APHIS-WS program policy prohibits the placement of traps closer than 30 feet to a draw station or visible bait (with the exception of traps placed for bears, mountain lions, or raptors) for the protection of scavenging birds. Advantages of the leg-hold trap are: 1) they can be set under a wide variety of conditions; 2) some targets can be relocated after capture; 3) nontarget captures can be released if it is deemed that they will survive; 4) traps can have padded jaws to reduce foot damage to predators in accordance with Colorado WS policy, and 4) pan-tension devices used by Colorado WS on traps for coyotes and other large predators reduce the probability of capturing nontarget animals smaller than the target species (Turkowski et al. 1984, Phillips and Gruver 1996). Disadvantages of using leghold traps include difficulty keeping them in operation during rain, snow, or freezing weather, and a lack of selectivity where nontarget species are of a similar or slightly heavier weight as the target species (animals much larger than the target species usually can pull themselves free from leghold traps). The use of leghold traps also requires more time and labor than many other methods, but they are indispensable in resolving many depredation problems. Leghold traps do have the potential to take some T&E species in Colorado, and therefore, may affect them. Additionally, the type of attractant, bait or visual lure, used at a trap set could increase the risk to particular nontarget species. For example, baits made with fish oil, anise oil, catnip, and fresh meat, or visual attractants such as pieces of fur, feathers, shiny metal, or fabric are generally attractive to lynx and would be more conducive to capturing other felids not intended to be captured.

Before leghold traps are employed, their limitations must be considered. Amendment 14, as applicable, limits the applicability of using leg-hold traps. Traps can be used on private lands with a CDOW 30 day exemption as authorized by Amendment 14. Only one exemption per parcel of land may be claimed in a calendar year. The use of traps is prohibited on public lands. Injury to target and nontarget animals, including livestock, may occur. Weather and the skill of the user often determines the success or failure of the leghold trap in preventing or stopping wildlife damage. Various tension devices can be used to prevent animals smaller than target animals from springing the trap. Trap placement and bait selection can also contribute to minimizing nontarget take. Although, livestock and nontarget animals may still be

captured even with pan-tension devices and effective trap placement. These traps usually permit the release of nontarget animals. Leghold traps pose a potential threat to a few T&E species so measures such as use of padded jaws and daily trap check are in place to protect these species.

Quick-Kill Traps come in a wide variety of styles and are rarely used in PDM (primarily for smaller predators). The primary quick-kill traps used in PDM are the smaller Conibears® for predators such as mink at aquaculture facilities or skunks and raccoons in cubbies. WS policy prohibits the use of quick-kill traps with a jaw spread exceeding 8 inches (i.e., 330 Conibears®) for land sets. The Conibear® consists of a pair of rectangular wire frames that close like scissors when triggered, killing the captured animal with a quick body blow. Conibear® traps have the added features of being lightweight and easily set. Conibear® traps, depending on where they are placed, could impact nontarget species. With the passage of State Constitutional Amendment 14 as has been found applicable and subsequent interpretations passed in SB 97-052, use of this method has been prohibited on public land and restricted to limited situations on private land.

<u>Cage Traps</u> come in a variety of styles which target different species. The most commonly known cage traps used in the current WS program are box traps. Box traps are usually rectangular, made from wood or heavy gauge wire mesh. These traps are used to capture animals alive and can often be used where many lethal or more dangerous tools would be too hazardous. Box traps are well suited for use in residential areas. Cage traps usually work best when baited with foods attractive to the target animal. They are used to capture animals ranging in size from mice to deer, but are usually impractical in capturing most large animals. However, large cage traps work well for capturing bears and suburban mountain lions, provided the traps can be transported by vehicle to the damage sites. On the other hand, cage traps are mostly ineffective for coyotes.

Cage traps have a few drawbacks. Some individual target animals avoid cage traps. Some nontarget animals become "trap happy" and purposely get captured to eat the bait, making the trap unavailable to catch target animals. These behaviors can make a cage trap less effective. Cage traps must be checked frequently to ensure that captured animals are not subjected to extreme environmental conditions; an animal may die quickly if the cage trap is placed in direct summertime sunlight. Another potential problem with the use of cage traps is that some animals fight to escape and become injured. However, most all nontarget species can be released during trap checks. The 1992 USFWS BO (USDA 1997, Appendix F) had no concerns with the use of cage traps for T&E species.

<u>Net Guns</u> of various sizes have occasionally been used by WS, primarily for research purposes, to catch target predators from aircraft or on the ground. These shoot from a "rifle with prongs," go about 20 yards, and wrap around the target animal. This technique is mostly used in research to capture animals that will be sampled or equipped with radio telemetry devices. These would most likely be used to assist in capturing particular species such as wolves or lynx for management purposes (i.e., returning them to appropriate habitat) with an applicable permit.

<u>Snares</u> made of wire or cable are among the oldest existing PDM tools. They can be used effectively to catch most species, but are most frequently used to capture coyotes, fox, mountain lions and bears. They are much lighter and easier to use than leg-hold traps and are not generally affected by inclement weather. Snares may be employed as either lethal or live-capture devices depending on how or where they are set. Snares set to capture an animal by the neck are usually lethal but "stops," devices to keep the snare loop from tightening to the extent that they would kill the animal, can be attached to the cable to make the snare a live capture device. Snares can incorporate a breakaway feature to release nontarget wildlife and livestock where the target animal is smaller than potential nontargets (Phillips 1996). These snares can be effectively used wherever a target animal moves through a restricted lane of travel (e.g. "crawls" under fences, trails through vegetation, or den entrances). When an animal moves forward into the loop formed by the cable, the noose tightens and the animal is held. Amendment 14 only allows use of these under a 30 day exemption on private lands.

The foot or leg snare is a spring-powered nonlethal device, activated when an animal places its foot on the trigger. Foot snares are used effectively to capture large predators such as mountain lions and black bears. Additionally, several foot snare designs have been developed to capture smaller predators such as coyotes and bobcats. In some situations using snares to capture wildlife is impractical due to the behavior or morphology of the animal, or characteristics of the particular location of the wildlife damage situation. Snares must be set in locations where the likelihood of capturing

nontarget animals is minimized. With the passage of State Constitutional Amendment 14 and subsequent interpretations passed in SB 97-052, use of this method has been prohibited on public land and restricted to limited situations on private land.

<u>Catch-poles</u> are made of a snare cable on a pole that can be tightened around an animal to capture it by hand (typically diseased or entrapped animals) or safely handle predators to remove them from traps. This device consists of a hollow pipe with an internal cable or rope that forms an adjustable noose at one end. The free end of the cable or rope extends through a locking mechanism on the end opposite the noose. By pulling on the free end of the cable or rope, the size of the noose is reduced sufficiently to hold an animal. Catch poles are used primarily to remove live animals from traps without danger to or from the captured animal.

Denning is the practice of seeking out the dens of depredating coyotes or red fox, excavating them, and destroying the young, adults, or both to stop or prevent depredations on livestock. Denning is used in coyote and fox damage management efforts, but is fairly limited because dens are often difficult to locate and den use by the target animal is restricted to about 2 to 3 months during the spring. Coyote depredations on livestock and poultry often increase in the spring and early summer because of the increased food requirements caused by the need to feed pups (Till and Knowlton 1983, Till 1982, 1992). The removal of pups often stops depredations, even though the adults may not be taken. When the adults are taken at or near a known den location, it is customary to euthanize the pups to prevent their starvation because they would be unable to survive on their own. Using this method, pups are removed from dens by excavation and then shot to the brain (not commonly conducted anymore), or they are killed in the den with a carbon monoxide-producing fumigant (discussed under chemical methods below). Den hunting for adult coyotes and their young is often combined with calling and shooting and aerial hunting. Denning is labor intensive with no guarantee of finding the den of the target animal. Denning is very target-specific and is most often used in open terrain where dens are comparatively easy to find.

Shooting is conducted with rifles, shotguns, and air guns and is very selective for the target species. Shooting is limited to locations where it is legal and safe to discharge firearms. Shooting is rarely used as the sole PDM method in a control operation because opportunities to shoot target animals are random and unpredictable. This is especially problematic for nocturnal species. However, shooting predators is frequently performed in conjunction with calling, particularly for coyotes, bobcats, and red fox. Vocal calls, handheld mouth-blown calls, and electronic calls can be used to mimic target species (e.g. coyote howls and raccoons fighting) or prey (e.g. injured jackrabbit and chicken) vocalizations. Trap-wise coyotes are often vulnerable to calling. Target animals are often called into close range by the WS Specialist which makes shooting much more effective.

Shooting in conjunction with night vision equipment including goggles or scopes is sometimes used in areas where traditional methods are unsuccessful or where chronic livestock depredation is occurring. Most livestock predators are nocturnal and are easier to take at night. This method is especially effective in high daytime, public use areas where problems with predators are occurring and the use of PDM methods would make it unsafe for the public during daylight hours.

Lethal reinforcement through shooting is often necessary for successful frightening programs (see the discussion on shooting under Frightening Devices), though this is most often used for flocking birds rather than predators.

Aerial Shooting or aerial hunting (shooting from an aircraft) is a commonly used coyote and red fox damage management method on all lands where authorized and deemed appropriate. It is especially effective in removing offending coyotes that have become "bait-shy" to trap sets or are not susceptible to calling and shooting. Aerial hunting consists of visually sighting target animals in the problem area and shooting them with a shotgun from an aircraft. Local depredation problems (particularly lamb and calf predation by coyotes) can often be resolved quickly through aerial hunting. Aerial hunting is species-selective and can be used for immediate damage relief, providing weather, terrain, and cover conditions are favorable. Aircraft are used to intercept and shoot coyotes or fox at locations where they have killed livestock. Aircraft are also used in searching for coyote dens. This method may also be used to reduce local coyote or fox populations in lambing and calving areas with a history of predation.

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Cain et al. (1972) rated aerial hunting as "very good" in effectiveness for problem solving, safety, and lack of adverse environmental impacts. Connolly and O'Gara (1987) documented the efficacy of aerial hunting in taking confirmed sheep-killing coyotes. Wagner (1997) found that aerial hunting may be an especially appropriate tool as it reduces risks to nontarget animals and minimizes contact between damage management operations and recreationists. Wagner (1997) also stated that aerial hunting was an effective method for reducing livestock predation and that aerial hunting 3 to 6 months before sheep are grazed on an area was cost-effective when compared with areas without aerial hunting.

Good visibility and relatively clear and stable weather conditions are required for effective and safe aerial hunting. Summer conditions limit the effectiveness of aerial hunting as heat reduces coyote activity and visibility is greatly hampered by vegetative ground cover. Air temperature (high temperatures), which influences air density affects low-level flight safety and may also restrict aerial hunting activities.

Fixed-wing aircraft are useful over flat and gently rolling terrain. However, due to their maneuverability, helicopters have greater utility and are more effective over brush covered ground, timbered areas, steep terrain, or broken land where animals are more difficult to spot. In broken timber or deciduous ground cover, aerial hunting is more effective in winter when snow cover improves visibility or in early spring before the leaves emerge. Aerial hunting is most effective when ground support crews direct aircraft by radio to the general location of animals which have been located by eliciting coyote howls using sirens, calls, or recorded coyote howls. APHIS-WS aircraft guidelines have been implemented to ensure that aerial hunting programs are conducted in a safe and environmentally sound manner and in accordance with Federal and State laws. Pilots and aircraft must be certified under established APHIS-WS program procedures. Only properly trained and certified APHIS-WS program employees are approved as aerial hunting crew members. Aerial hunting is generally perceived by the public as being more desirable than poisons, since shooting is selective and results in quick death. However, there is an inherent risk to aerial hunting crews. Aerial hunting has a negligible effect on the environment.

<u>Hunting Dogs</u> are frequently used in PDM to locate, pursue, or decoy animals. WS uses trailing/tracking, decoy, and trap-line companion dogs. Training and maintaining suitable dogs requires considerable skill, effort, and expense. There must be sufficient PDM requests for dogs in order to make the effort of training worthwhile.

Tracking Dogs or trailing dogs are commonly used to track and "tree" target wildlife species such as black bears, mountain lions, bobcats, and raccoons. Though not as common, they sometimes are trained to track coyotes (Rowley and Rowley 1987, Coolahan 1990). Dogs commonly used are different breeds of hounds such as blue tick, red-bone, and Walker. They become familiar with the scent of the animal they are to track and follow, and the dogs strike (howl) when they detect the scent. Tracking dogs are trained not to follow the scent of nontarget species. WS Specialists typically find the track of the target species at fresh kills or drive through the area of a kill site until the dogs strike. WS Specialists then put their dogs on the tracks of the predator. Typically, if the track is not too old, the dogs can follow the trail and "tree" the animal. The animal usually seeks refuge up a tree, in a thicket on the ground, on rocks or a cliff, or in a hole. The dogs stay with the animal until the WS Specialist arrives and dispatches, tranquilizes, or releases the animal, depending on the situation. A possibility exists that dogs could switch to a fresher trail of a nontarget species while pursuing the target species. This can occur with any animal that they have been trained to follow, and can also occur with an animal that is similar to the target species. For example, dogs on the trail of a bobcat could switch to a lynx, if they cross a fresher lynx track. With this said, tracking dogs could potentially have an impact on nontarget species, though this risk can be minimized greatly by WS Specialists looking at the track prior to releasing the hounds and calling the dogs off a track if it is determined that they have switched tracks.

Decoy Dogs are frequently used in coyote damage management in conjunction with calling. Dogs are trained to spot, lightly engage, and lure coyotes into close shooting range for WS Specialists. Decoy dogs are especially effective for territorial pairs of coyotes. Decoy dogs are typically medium sized dogs such as small Labradors and mountain curs that are trained to stay relatively close to the WS Specialist. These dogs typically get close to coyotes but return when the coyotes start chasing them.

Trap-line Companion Dogs often accompany WS Specialists in the field while they are setting and checking equipment.

They are especially effective in finding sites to set equipment by alerting their owners to areas where coyotes or other predators have traveled, urinated or defecated; these are often good sites to make sets. Trap-line companion dogs stay with the WS Specialists and most always have no effect on nontarget animals.

<u>Relocation</u> is the capturing of an animal with one of the nonlethal take methods and translocating the animal to a new site, far enough away so that the animal will not return. WS typically does not recommend relocation of common or dangerous wildlife for reasons discussed further in Section 3.3.6.2. Relocation is an important method for wildlife management, especially for the propagation of T&E or sensitive species. CDOW or USFWS would establish policies and make most decisions relating to wildlife relocation taking into account population goals for the different species.

Chemical Immobilizing and Euthanizing Drugs are important tools for managing wildlife. Under certain circumstances, WS personnel are involved in the capture of animals where the safety of the animal, personnel, or the public are compromised and chemical immobilization provides a good solution to reduce these risks. For example, chemical immobilization has often been used to take black bears, mountain lions, coyotes, and raccoons in residential areas where public safety is at risk. WS employees that use immobilizing drugs are certified for their use and follow the guidelines established in the APHIS-WS Field Operational Manual for the Use of Immobilization and Euthanasia Drugs. Telazol® (tiletamine) and Ketamine/Xylazine are immobilizing agents used by WS to capture and remove predators from a particular area. These are typically used in urban, recreational, and residential areas where the safe removal of a problem animal is most easily accomplished with a drug delivery system (e.g. darts from rifle, pistol, blow guns, or syringe pole). Immobilization is usually followed by release (i.e., after radio collaring a mountain lion for a study), relocation, or euthanasia. Euthanasia is usually performed with drugs such as Beuthanasia-D® or Fatal-Plus® which contain forms of sodium phenobarbital. Euthanized animals are disposed of by incineration or deep burial to avoid secondary hazards. Drugs are monitored closely and stored in locked boxes or cabinets according to APHIS-WS policies, and Department of Justice or Drug Enforcement Administration guidelines. Most drugs fall under restricted-use categories and must be used under the appropriate license from the U.S. Department of Justice, Drug Enforcement Administration. Since the use of immobilizing drugs requires the user to be in close quarters to the target animal, the take of nontargets is nullified.

Chemical Medication Drugs are being used by APHIS-WS nationally to treat animals that are infected with a disease or other malady, or to prevent the spread disease (e.g. rabies). APHIS-WS is involved in disease surveillance, monitoring, and management programs to assist in minimizing the spread of disease and reduce the potential for humans to be infected. This may require that medication be given to wildlife through injections, or via oral or topical applications. Oral treatments, if not administered directly by a tube, are often disguised in baits acceptable by the target animal. Risk assessments on drugs being used in the field are completed prior to their use. This includes potential side-effects to T&E species found in the range of their use. APHIS-WS is using an oral rabies vaccine that is a genetically engineered recombinant vaccinia-rabies glycoprotein (Raboral V-RG® MERIAL, Inc.) vaccine. It is currently licensed for use in raccoons in the United States and Canada and approved for experimental use in gray fox and coyotes in Texas. It is not currently being used by WS in Colorado, but is likely to be. The vaccine has been extensively evaluated in the laboratory for safety in more than 50 vertebrate species with no adverse effects, regardless of inoculation route or dose. If used in Colorado to reduce the spread of rabies, it should have no adverse effects on nontarget species.

Chemical Pesticides are widely used because they are often very effective at reducing or stopping damage. Although some pesticides are specific to certain taxonomic groups (e.g. birds vs. mammals), pesticides are typically not species specific, and their use may be hazardous to nontarget species unless they are used with care by knowledgeable personnel. The proper placement, size, type of bait, and time of year are keys to selectivity and successful use of pesticides for PDM. When a pesticide is used according to its Environmental Protection Agency (EPA) registered label, it poses minimal risk to people, the environment, and nontarget species. WS personnel are required by policy to adhere to label requirements including any literature that accompanies the label, but is not attached to the product. WS personnel that use these chemicals must be certified as chemical applicators and are required to adhere to all certification requirements set forth by FIFRA and CDA. EPA pesticide registration requires rigorous testing to determine potential effects on humans and the environment including risks to nontarget species. Suitable pesticides for controlling predator damage are limited. Following are the pesticides used by WS in PDM. Amendment 14 prohibits the use of pesticides on public

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lands and restricts them to a 30 day time period on private lands.

M-44/Sodium Cyanide (EPA. Reg. No. 56228-15) is used in the M-44 device, a spring-activated ejector device developed specifically to kill coyotes and other canids. The M-44 is a mechanical device that ejects sodium cyanide powder into the mouth of an animal that pulls up on it with its teeth. The M-44 is made of four parts and is set with special pliers. It is selective for canids, which are members of the dog family, due to their feeding behavior (scavenging) and because the attractants used are relatively canid-specific. When properly used, the M-44 presents little risk to humans and the environment, and provides an additional tool to reduce predator damage. The M-44 device consists of: (1) a capsule holder wrapped with fur, cloth, or wool; (2) a capsule containing 0.8 gram of powdered sodium cyanide; (3) an ejector mechanism; and (4) a 5-7 inch hollow stake. The hollow stake is driven into the ground, the ejector unit is cocked and placed in the stake, and the capsule holder containing the cyanide capsule is screwed onto the ejector unit. A fetid meat or other suitable bait is spread on the capsule holder. An animal attracted by the bait will try to pick up or pull the baited capsule holder. When the M-44 device is pulled, a spring-activated plunger propels sodium cyanide into the animal's mouth. Toxic symptoms may occur when swallowed, inhaled as a dust, or absorbed through the skin. When it comes in contact with carbon dioxide or acids, it forms hydrogen cyanide gas (HCN). HCN is highly and quickly toxic by contact, ingestion, or inhalation of vapors at which time it enters the bloodstream. HCN is an asphyxiant that prohibits the use of oxygen which affects cellular activities and functions of all tissues in the body. The body is unable to use oxygenated blood (arterial blood). The body will respond to cyanide poisoning with a variety of symptoms depending on the amount of exposure. The characteristic response is a rapid loss of consciousness and cessation of breathing except with the mildest of exposures. After ingestion of a large dose of sodium cyanide, the target species may become unconscious within a few seconds. Breathing is rapid at first, but soon becomes slow and gasping. Convulsions may follow, but in severe poisoning cases, especially if untreated, coma and death may occur in a few minutes. M-44 users carry an antidote kit which consists of six amyl nitrite pearls while setting out or checking the devices. WS personnel must be certified to use the M-44. The EPA label for the M-44 includes 26 use restrictions. Although the M-44 is selective for canids, WS takes some nontargets other than canids on rare occasions.

Large Gas Cartridges (EPA. Reg. No. 56228-21) are fumigant devices that emit gases to take burrowing wildlife and reduce damage associated with them. These are very efficient, but often expensive. In PDM, WS only uses gas cartridges in coyote, fox, and skunk dens. When ignited, the cartridge burns in the den of an animal and produces large amounts of carbon monoxide, a colorless, odorless, and tasteless, poisonous gas. The combination of oxygen depletion and carbon monoxide exposure kills the animals in the den. Carbon monoxide euthanasia is recognized by the American Veterinary Medical Association as an approved and humane method to kill animals (American Veterinary Medical Association 1987). The APHIS-WS Program's Pocatello Supply Depot manufactures gas cartridges especially formulated for fumigation of dens. WS would only use gas cartridges in dens that show signs of active target animal use. Therefore, these are mostly very target-specific and will have no effect on nontarget species.

3.2.2 Alternative 2 - No Federal WS PDM

This alternative would consist of no Federal involvement in PDM in Colorado. Neither direct operational management nor technical assistance with the PDM methods described under Alternative 1 would be provided from WS. Information on future developments in nonlethal and lethal management techniques that culminate from the WS National Wildlife Research Center would also not be available to producers or resource owners. Under this Alternative, predator damage conflicts would be handled by CDOW, CDA, private resource owners and managers, private contractors, or other government agencies. This alternative is discussed in detail in USDA (1997).

3.2.3 Alternative 3 - Technical Assistance Only

This alternative would allow WS to provide technical assistance with PDM techniques, such as guard dogs, frightening devices, harassment, fencing, exclusion, animal husbandry, modification of human behavior, habitat modification, cage traps, leghold traps, neck snares, and chemical methods available for the public. WS would also loan equipment used for nonlethal control. WS would only be authorized to assist in lethal PDM activities when it was necessary for public safety. Lethal PDM methods for the protection of other resources could be applied by persons with little or no training

or experience. Technical assistance may assist some resource owners in implementing PDM safely.

3.2.4 Alternative 4 - Nonlethal Required before Lethal Control

This alternative would require that: 1) resource owners show evidence of sustained and ongoing use of nonlethal or husbandry techniques aimed at preventing or reducing damage from predators, prior to receiving the services of WS; 2) WS Specialists use or recommend appropriate nonlethal techniques in response to a confirmed damage situation prior to using lethal methods; and 3) lethal techniques be used only when the use of husbandry or nonlethal techniques has failed to keep resource losses below an acceptable level as indicated by the cooperator. This alternative is analyzed and discussed in USDA (1997). Producers would still have the option of implementing lethal PDM measures on their own and WS would continue to recommend lethal PDM methods when and where appropriate.

3.2.5 Alternative 5 - Corrective Control Only When Lethal PDM Methods are Used

This alternative would allow PDM only where predation on livestock or other damage from predators has occurred. Incumbent in this alternative is WS verification of the loss and the species responsible. Producers could still implement any legal nonlethal or lethal methods they determine to be practical and effective. Lethal control by WS would be limited to an area near the loss to maintain the integrity of the corrective only situation. The full variety of mechanical and chemical control methods described for Alternative I would be available, once damage has occurred and the responsible species has been verified by WS.

3.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

Several alternatives were considered but not analyzed in detail. These were not considered because of problems associated with their implementation as described below.

3.3.1 Compensation for Predator Damage Losses

The compensation alternative would require the establishment of a system to reimburse resource owners for predation or other losses. Currently, CDOW compensates ranchers for black bear and mountain lion livestock losses, but often captures the offending animal because typically become repeat offenders. This alternative for all losses associated with predators has been eliminated from further analysis because no federal laws currently exist to authorize such action. Under such an alternative, WS would not provide any direct control to reduce predator damage because losses would be compensated when damage was verified to be caused by predators. Aside from lack of legal authority, analysis of this alternative in USDA (1997) indicates that the concept has many drawbacks:

- It would require larger expenditures of money and manpower to investigate and validate all losses, and determine and administer appropriate compensation.
- It would be difficult, if not impossible, to assess and confirm losses in a timely manner for all requests, and, therefore, many losses could not be verified and would go uncompensated. Additionally, where compensation was paid, it would most likely be below full market value.
- Compensation would give little incentive to livestock and other resource owners to limit predation or damages with PDM strategies such as improved animal husbandry practices and fencing.
- Not all ranchers would rely completely on a compensation program and PDM activities including the use of lethal PDM methods would likely continue as permitted by state law.
- Congress has not appropriated funds to compensate for predation or other wildlife damage to agricultural products.

3.3.2 Bounties

Bounties are the payment of funds for killing predators in a given area. A bounty law still exists in Colorado and CDA is obligated to pay bounties for certain predators. In addition, some counties in Colorado have a bounty system for take of certain predators and pay funds for such take. Bounties have not been supported by Colorado State agencies (CDOW and CDA) or most wildlife professionals for many years (Latham 1960). WS concurs because bounties are generally not effective in abating damage, especially over a wide area such as Colorado, but are good at removing surplus animals. A standard problem with bounties is that the circumstances surrounding the take of animals are typically arbitrary and completely unregulated. Abuse is often common with bounty systems and many animals could come from places outside the bounty area. Finally, WS does not have the authority to establish a bounty program and would rely on the State or Counties to continue supporting bounties. It is likely that this system will be changed because of inherent problems with such a system to reduce damage.

3.3.3 Eradication and Long Term Population Suppression

An eradication alternative would direct all WS efforts toward total long term elimination of coyotes and perhaps other predator species in entire cooperating areas or larger defined areas in Colorado. The eradication of predator species is not a desired goal of state or federal agencies. Some landowners would prefer that some species of predators be eradicated, especially those that have become abundant and caused damage without intervention from wildlife agencies (International Association of Fish and Wildlife Agencies 2004). However, eradication as a general objective for PDM will not be considered by WS in detail because WS, CDOW, CDA, USFWS, BLM, USFS, and most members of the public oppose eradication of any native wildlife species. Additionally, the eradication of a native species or local population would be extremely difficult, if not impossible to accomplish, and cost-prohibitive in most situations.

Suppression would direct WS efforts toward managed reduction of certain problem populations or groups. In localized areas where damage can be attributed to predation by specific groups, CDOW has the authority to increase hunting seasons and hunter tag quotas. If a large number of requests for WDM are generated from a localized area, WS would consider suppression of the local population or groups of the offending species, if appropriate. It is not realistic, practical, or allowable under present WS policy to consider large-scale population suppression. Typically, WS activities in Colorado are conducted on a very small portion of the area inhabited by the problem species, and therefore, eradication or long term population suppression is unrealistic.

3.3.4 The Humane Society of the United States Alternative

The Humane Society of the United States has proposed an alternative that requires: 1) "permittees evidence sustained and ongoing use of nonlethal/husbandry techniques aimed at preventing or reducing predation prior to receiving the services of WS"; 2) "WS employees use or recommend as a priority the use of appropriate nonlethal techniques in response to a confirmed damage situation"; 3) "lethal techniques are limited to calling and shooting and ground shooting, and used as a last resort when use of husbandry or other nonlethal PDM methods have failed to keep livestock losses below an acceptable level"; and 4) "establish higher levels of acceptable loss thresholds on public lands than for private lands".

The major components of this proposed alternative have been analyzed in detail in the alternatives contained in this EA and through court rulings. The Humane Society of the United States alternative would not allow for a full range of IWDM techniques to resolve wildlife damage. In addition, WS is charged by law to protect American agriculture, despite the cost of PDM. Further, in the case Southern Utah Wilderness Society et al. vs. Hugh Thompson et al. U.S. Forest Service (Civil No. 92-C-0052A 1993), the court clearly stated that, "The agency need not show that a certain level of damage is occurring before it implements a WS Program. . . . Hence, to establish need for WS, the forest supervisors need only show that damage from predators is threatened." Thus, judicial precedence was set and found that it is not necessary to establish a criterion, such as percentage of loss of a herd to justify the need for PDM provided by WS. Proactive and reactive control actions are therefore justified by a reasonable determination that damage by predators is threatened. The alternatives selected for detailed analysis in this EA encompass a reasonable range as required by NEPA

and include some of the suggestions in this proposal. It is believed that inclusion of this alternative would not contribute new information or options for consideration and analysis.

3.3.5 No PDM Within any Wilderness or Proposed Wilderness.

Under the current WS program in Colorado, the amount of PDM that occurs in wilderness areas is so minor that the effects of the No Action Alternative or the Current Program would not be notably different from the effects of a "No Control in Wilderness Areas" alternative. The minor amount of PDM that is conducted by WS in wilderness or proposed wilderness areas conforms to legislative and policy guidelines applicable to WS. WS and the land management agency meet annually to review work plans that delineate what, when, why and where PDM would be conducted. WS coordinates activities in WAs with the land managing agency as required. SOPs specific to this issue are listed in Section 3.4.2.4.

3.3.6 Non-lethal Control Only

This Alternative has normally been an alternative considered by WS, such as in the FEIS (USDA 1997) and other WS EAs. This alternative would not allow the use of lethal methods by WS as described under the proposed action to relieve damage caused by predators (see Section 3.2.1.2 for description of methods used in PDM). Resource owners or managers would still have the option of implementing lethal control measures and WS would continue to recommend lethal and nonlethal methods, but would only use nonlethal methods operationally. However, few nonlethal methods used in PDM such as livestock management practices (e.g., night-penning, herding, carcass removal) and physical exclusion (e.g. predator-proof fencing) are practical for implementation by WS personnel. Most nonlethal methods are put into use by the resource owner (Knowlton et al. 1999). Many of these methods (e.g., fencing and guard dogs) require significant time to implement and have a high initial cost (Mitchell et al. 2004). Even with the additional effort and costs, these methods are not always effective at reducing damage and potentially have side-effects (e.g. concentrating livestock can cause unwanted damage to particular pasture areas) (Knowlton et al. 1999).

A few public commentors consider this to be the Alternative of choice and cite literature such as Mitchell et al. (2004) indicating that nonlethal can be very effective. However, Mitchell et al. (2004) and others such as Knowlton et al. (1999) indicate that, although certain nonlethal methods have shown promise, further research is needed to determine their effectiveness and practicality. Additionally, most livestock producers already use nonlethal methods to reduce predation. NASS (1998) reported survey data suggesting that 80 percent of Colorado sheep producers employed one or more nonlethal predator control measures; 44% reported using guard dogs, 44% utilized predator resistant fencing, 41% used night penning, 38% used shed lambing, 16% used herding/gathering or moving of livestock, and 8% used nonlethal frightening methods. Andelt (1992) reported that about 1/3 of sheep producers using guard dogs indicated that the use of dogs did not reduce their reliance on other predator control techniques or on predator control agencies. Therefore, nonlethal methods are an important part of the mix of current strategies used for meeting PDM needs in the State, but have not kept losses low enough to satisfy many producers. In addition, we would expect many producers would reject WS assistance and resort to their own lethal control means if WS were to adopt this alternative.

Finally, a nonlethal only alternative would be similar to the Technical Assistance Only Alternative since the majority of methods are put into practice by the resource owners. Therefore, as a result of the discussion above and its similarity to the Technical Assistance only Alternative, this was dropped from further analysis.

3.3.7 Management Techniques Not Considered for Use in IWDM

3.3.7.1 Mountain Lion Sport Harvest Alternative. An alternative to offer sport harvest of mountain lions where control is required, prior to WS involvement, was considered but rejected from detailed analysis. CDA and CDOW have the authority to determine the most appropriate means to take depredating lions. CDA and CDOW have indicated that it is not completely feasible as a method of control for depredating lions due to inherent problems taking the target individual and because a quick response is often required. CDOW currently allows the take of certain depredating lions or populations through sport hunting and will continue to do so.

3.3.7.2 Relocation Rather Than Killing Problem Wildlife. Translocation may be appropriate in some situations (i.e., if the problem species' population is at very low levels such as the kit fox, suitable relocation sites are available, and the additional dollars required for relocation can be obtained). However, those species that often cause damage problems (e.g. coyotes, red fox, black bears, mountain lions) are relatively abundant or are not native (e.g. feral cats) and relocation is not necessary for the maintenance of viable populations. Relocation may also result in future depredations if the relocated animal encounters protected resources, and in some cases could require payment of damage compensation claims. Any decisions on relocation of wildlife by WS are coordinated with CDOW and consultation with the appropriate land management agency(ies) or manager associated with proposed release sites.

The American Veterinary Medical Association, the National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists oppose the relocation of mammals due to the potential for disease transmission to a healthy local population. This is particularly true for small mammals such as raccoons or skunks (Center for Disease Control 1990). Although relocation is not necessarily precluded, in many cases, it would be logistically impractical and biologically unwise. Relocation of wildlife is also discouraged by APHIS-WS policy (WS Directive 2.501) because many factors can affect the outcome (stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats). However, there may be exceptions for relocating certain species. Relocation of problem wildlife might be a viable solution, acceptable to the public, with wildlife that are considered to be of high value such as T&E species.

3.3.7.3 Immunocontraceptives or Sterilization Should Be Used Instead of Lethal PDM. Contraceptive measures for mammals can be grouped into four categories: surgical sterilization, oral contraception, hormone implantation, and immunocontraception (the use of contraceptive vaccines). These techniques would require that each individual animal receive either single, multiple, or possibly daily treatment to successfully prevent conception. The use of oral contraception, hormone implantation, or immunocontraception would be subject to approval by Federal and State regulatory agencies.

These methods were not analyzed in detail in the EA because: (1) surgical sterilization would require that each animal be captured and sterilization conducted by licensed veterinarians and would, therefore, be extremely labor intensive and expensive; and (2) currently no Federal or State approved chemosterilants are available for operational use in PDM.

Bromley and Gese (2001a, 2001b) conducted studies to determine if surgically sterilized coyotes would maintain territories and pair bond behavior characteristics of intact coyotes, and if predation rates by sterilized coyote pairs would decrease. Their results suggested that behaviorally, sterile coyote pairs appeared to be no different than intact pairs except for predation rates on lambs. Reproductively intact coyote packs were 6 times more likely to prey on sheep than were sterilized packs (Bromley and Gese 2001b). They believed this occurred because sterile packs did not have to provision pups and food demands were lower. Therefore, sterilization could be an effective method to reduce lamb predation if enough alpha (breeding) pairs could be captured and sterilized. During Bromley and Gese's (2001a, 2001b) studies: (1) they captured as many coyotes as possible from all packs on their study area, (2) they controlled coyote exploitation (mortality) on their study area and found survival rates for their coyotes were similar to those reported for mostly unexploited wild coyote populations, and (3) they concluded a more effective and economical method of sterilizing resident coyotes was needed to make this a practical management tool on a larger scale (Bromley and Gese 2001b).

As alternative methods of delivering chemosterilants are developed, sterilization may prove to be a practical tool in some circumstances (DeLiberto et al. 1998). Reduction of local populations could conceivably be achieved through natural mortality combined with reduced fecundity. However, no predators would be killed directly with this method and treated predators could continue to cause damage. Populations of dispersing predators would probably be unaffected.

Potential environmental concerns with chemical sterilization would still need to be addressed, including safety of genetically engineered vaccines to humans and other wildlife. At this time, chemical sterilization is controversial among wildlife biologists and many others. In any event, no contraceptive agents or methods are currently registered. As such, they are neither legal nor practical for use on predators. Should any become registered in the future, WS could consider

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them among the methods to be used in PDM. At that time, any additional NEPA analyses deemed necessary would be completed.

3.3.7.4 Lithium Chloride as an Aversive Agent. Lithium chloride has been tested as a taste aversion agent to condition coyotes to avoid livestock, especially sheep. Despite extensive research, the efficacy of this technique remains unproven (Conover et al. 1977, Sterner and Shumake 1978, Burns 1980, 1983, Burns and Connolly 1980, 1985, Horn 1983, Johnson 1984). In addition, lithium chloride is currently unregistered by EPA or CDA, and therefore cannot be used or recommended for this purpose.

3.4 WS SOPS INCORPORATED INTO PDM TECHNIQUES

An SOP is any aspect of an action that serves to prevent, reduce, or compensate for negative impacts that otherwise might result from that action. The current program, nationwide and in Colorado, uses many such SOPs. Many WS SOPs are discussed in depth in USDA (1997, Chapt. 5). The key SOPs are incorporated into all alternatives as applicable, except the no federal program alternative (Alternative 2). Most SOPs are instituted to abate specific issues while some are more general and relate to the overall program. SOPs include those recommended or required by regulatory agencies such as EPA and these are listed where appropriate. Additionally, specific measures to protect resources such as T&E species that are managed by WS's cooperating agencies (USFWS and CDOW) are included in the lists below.

3.4.1 General SOPs Used by WS in PDM

- WS PDM activities in Colorado are consistent with USDA (1997) SOPs.
- WS complies with all applicable laws and regulations that pertain to working on federally managed lands.
- WS coordinates with Tribal officials for work on Tribal lands to identify and resolve any issues of concern with PDM.
- The use of PDM methods such as traps and snares conform to applicable rules and regulations administered by the State.
- WS personnel adhere to all label requirements for toxicants. EPA approved labels provide information on preventing exposure to people, pets, and T&E species along with environmental considerations that must be followed. WS personnel abide by these. These restrictions invariably preclude or reduce exposure to nontarget species, the public, and pets.
- The WS Decision Model (Slate et al. 1992) thought process as discussed in Section 1.5.5, which is designed to identify effective wildlife damage management strategies and their impacts, is consistently used.

3.4.2 WS SOPs Specific to the Issues

The following is a summary of the SOPs used by WS that are specific to the issues listed in Chapter 2 of this document.

3.4.2.1 Effects on Target Predator Species Populations.

- PDM is directed toward localized populations or individual offending animals, depending on the species and
 magnitude of the problem, and not an attempt to eradicate any native wildlife population in a large area or
 region.
- WS Specialists use specific trap types, lures, and placements that are most conducive for capturing the target animal.

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• WS PDM kill is monitored. Both "Total Harvest" and estimated population numbers of key species are used to assess cumulative effects of harvest. WS PDM is designed to maintain the level of harvest below that which would impact the viability of populations of native species (see Chapter 4). WS provides data on total take of target animal numbers to other agencies (i.e., CDOW, USFWS) as appropriate.

- Decisions to kill problem bear, mountain lions, foxes, bobcats, coyotes, raccoons, opossums, and striped skunks damaging agricultural resources are made by WS under the authority of CDA. All other species are controlled under CDOW authority. Decisions to relocate any species is coordinated with the CDOW. CDOW would be notified in a timely manner of all take for species such as black bear and mountain lion.
- WS currently has agreements for PDM on less than 20% of the land area of Colorado. In a typical year, WS takes target predators on less than 5% of the land area, and therefore, should have no impact on target predator species typically on at least 90% of the land area in Colorado.

3.4.2.2 Effects on Nontarget Species Populations, Including T&E Species.

- WS personnel are highly experienced and trained to select the most appropriate method(s) for taking problem animals with little impact on nontarget species.
- WS personnel work with research programs such as the WS National Wildlife Research Center to continue to improve the selectivity of management devices.
- Traps and snares are not set within 30 feet of exposed carcasses (i.e., "draw stations") to prevent the capture of scavenging birds such as bald eagles and condors. The only exception to this policy is for the capture of mountain lion and black bear because the weight of these two target animals adequately allows foot capture-device tension adjustments to exclude the capture of smaller nontarget animals such as scavenging birds.
- Foot snare trigger and leghold trap underpan-tension devices are used by WS, as appropriate, throughout Colorado to reduce the capture of nontarget wildlife that weigh less than the target species.
- Breakaway snares, designed to break open and release when tension is exerted by a larger nontarget animal such as deer, antelope or livestock, have been developed and are being refined. These snares would be implemented into the WS program as appropriate.
- Nontarget animals captured in leghold traps or foot snares are released at the capture site unless it is determined by WS Specialists that the animal is not capable of self maintenance.
- PDM activities are directed at taking action against individual problem animals, or local populations, to resolve damage problems associated with them. It is generally accepted that predators do not substantially influence prey numbers. In fact, the opposite tends to be true; the cyclic nature of most prey species affects predator numbers (Clark 1972, Wagner and Stoddart 1972). This is especially true of highly fecund species such as rodents and rabbits, but less so for species such as deer and T&E species. Thus, predator removal in Colorado will likely have minimal impact on prey species with the exception of programs in very localized areas.
- When working in an area that has T&E species or has the potential for T&E species to be exposed to PDM methods, WS personnel will know how to identify sign of the target and T&E species (e.g. bobcat vs lynx), and apply PDM methods accordingly.
- Measures to Reduce the Potential Take of Specific T&E Species
 - Grizzly Bear. If WS, CDOW, or other agency has found evidence of grizzly bears, WS would implement measures identified by USFWS in their 1992 BO (USDA 1997, Appendix F) to avoid take of this species.

However, it is believed that they have been extirpated from the State (CDOW 2004).

Black-footed Ferret. WS has adopted and implemented all reasonable and prudent alternatives to protect the black-footed ferret that were identified by USFWS in their 1992 BO (USDA 1997, Appendix F) The primary methods that would impact ferrets are leghold traps and gas cartridges. WS uses pan-tension devices on leghold traps set in and around prairie dog towns which may support ferrets. WS follows the Reasonable and Prudent Alternatives as described by USFWS (USDA 1997) to determine where gas cartridges can be used.

Kit Fox. WS follows CDOW's guidelines for minimizing the potential to take kit fox in their range as defined in CDOW's regulations. In kit fox range, WS uses pan-tension devices on leghold traps and snares with stops or an 11" loop. Traps and snares are checked daily and the use of M-44s is not allowed. If WS targets a kit fox because of damage, CDOW will be notified to determine if it should be relocated.

Canada Lynx. WS abides by the August 23, 2005 BO obtained from the USFWS, which contains authorization for incidental take and reasonable and prudent measures and terms and conditions for minimizing take. Currently, WS uses detailed maps of the general locations of reintroduced lynx provided by CDOW (Shenk 2005) and is awaiting maps to be determined by interagency efforts of the CDOW, USFWS, USFS, and BLM. The lynx are radio collared, and locations are obtained by receiving their radio signals via satellites or by aerial searches using VHF radio receivers. In general, lynx have been found in National Forests with some occasionally wandering into non-lynx associated habitat. The latter is often expected for animals that have been hard-released (captured in Canada and Alaska and released without keeping them in on-site pens for an extended period of time prior to their release in Colorado). Lynx that were released in the initial release were hard-released and wandered significantly. However, since that time, lynx have been held in pens for several weeks to acclimatize and these have not wandered as much out of suitable lynx habitat areas. The maps that CDOW develops provide a good insight as to where lynx can be expected to occur (Shenk 2005). CDOW has agreed to keep Colorado WS informed of unusual lynx locations in Colorado so WS personnel can take steps to avoid them. When Colorado WS personnel conduct PDM in lynx habitat (primarily higher elevation areas of USFS NFs where they have been found), shooting will be the preferred method whenever it can be used practically and effectively to resolve a problem situation and poses virtually no risk of incidental lynx take. Further restrictions on WS PDM methods to avoid lynx take that are now part of WS SOPS while operating under the August 23, 2005 BO are as follows.

- All Colorado WS personnel conducting PDM in or near lynx occupied habitat will be trained in identification of lynx and lynx sign, and snowshoe hare and their sign if conducting PDM in lynx habitat.
- No fetid baits or attractants will be used in coyote trap sets within lynx habitat.
- Leg-hold traps and foot or leg snares set for larger predators must be equipped with pan tension devices sufficient to reduce the likelihood of capturing lynx or other animals up to 35 pounds in lynx habitat.
- No neck snares may be used for capturing coyotes or bobcats within lynx habitat; neck snares for capturing lions, bears, and (if and when they occur in the State and WS is authorized to capture them) wolves may be used within lynx habitat if they are equipped with "stops" (to prevent the snare loop from closing down below a size that could choke or otherwise hold a lynx).
- WS may not use M-44 devices or large gas cartridges (in coyote dens) within lynx habitat.
- WS must remove any tracking dog from trailing a lynx.
- WS must immediately release any incidentally captured lynx after notifying the USFWS or CDOW,

if practical, unless the lynx has been injured and cannot be rehabilitated or safely released, at which point it may be euthanized after USFWS approval.

- WS must report details of any trapped, lethally taken, lynx or lynx-related observations to the nearest USFWS office and CDOW, and must make efforts to contact the USFWS when a lynx is captured alive to determine if the lynx should be radio-collared, or released immediately.
- WS must notify appropriate CDOW and USFWS offices within 24 hours if a lynx is killed and must assist in preserving and transporting the carcass to the appropriate agency(ies) for analysis.

River Otter. To avoid taking river otter, WS does not set water traps in the following four recovery areas, except with: a) padded-jaw leghold traps; b) Conibear® type traps less than 220 in size; or c) land or water set snares with a closure size of 16 inch circumference or larger. These areas are:

- 1) That portion of the Gunnison River and five (5) miles upstream along each of its tributaries in Montrose and Delta Counties from the Black Canyon of the Gunnison National Monument downstream to that point where the river meets Highway 92; and all lands within 100 yards of the high water line of this portion of the Gunnison River and all tributaries thereof.
- 2) That portion of the Piedra River upstream from Navajo Reservoir to the headwaters including East Fork and Middle Fork of the Piedra River in Hinsdale and Archuleta counties and 9 miles upstream on the First Fork. This restriction includes the following tributaries: Sand Creek, Weminuche Creek, Little Sand Creek, Williams Creek, and all lands within 100 yards of the high water mark line of the above waters.
- 3) The Dolores River from the McPhee Reservoir downstream to Bed Rock within 100 yards of the high water line.
- 4) The San Juan River from Pagosa Springs downstream to the New Mexico state line within 100 yards of the high water line.

In addition, padded-jaw traps and snares are not be used in drowning sets and padded jaw traps and land set snares may only be set in accordance with the provisions of 33-6-205 CRS, 33-6-206 CRS, or 33-6-207 CRS; and that water set snares and Conibear® traps may only be set in accordance with the provisions of 33-6-205, CRS, or 33-6-207, CRS.

Gray Wolf. WS has adopted and implemented conservation measures outlined in the USFWS 1992 BO and Conference Opinion (USDA 1997, USFWS 1998a) to protect the Mexican gray wolf, both potentially natural occurring (those these were likely extirpated) and reintroduced populations.

- Contact USFWS's or CDOW's Gray Wolf Coordinator to verify any WS sightings of gray wolves in Colorado. Colorado has almost 7,000 wolf-dog hybrids, and potentially could be one of these released into the wild.
- WS will not use M-44s and neck snares in the immediate area of "occupied gray wolf range" in accordance with the 1992 BO on the Wildlife Services National program. Occupied gray wolf range as defined by the 1992 BO is 1) an area in which gray wolf presence has been confirmed by State or Federal biologists through interagency wolf monitoring programs, and USFWS has concurred with the conclusion of wolf presence, or 2) an area from which multiple reports judged likely to be valid by USFWS have been received, but adequate interagency surveys have not yet been conducted to confirm presence or absence of wolves.

• WS will require that all leghold traps and leghold snares be checked at least once a day in areas known to be occupied by gray wolves. Use of electronic monitoring of traps or snares for daily checks may be used in monitoring traps or snares.

- WS will require that Specialists involved in aerial hunting and ground shooting in areas where gray wolves have been documented will be limited to those personnel who can distinguish coyotes from wolves.
- All WS employees will be given a basic wolf identification training course approved by USFWS.
- WS will abide by all applicable reasonable and prudent alternatives, measures, and terms and conditions required as a result of findings in any ESA consultations between WS and USFWS.
- WS may assist the Wolf Recovery Team, CDOW or CDA in trapping wolves so that they can be examined. The use of immobilizing drugs to capture a wolf will only be conducted by WS personnel certified in their use.
- In the event that a wolf has been found to kill livestock in Colorado, WS will verify and document the predation, obtain pertinent evidence such as photographs, and contact the USFWS Wolf Recovery Team. Should the Recovery Team determine that the offending individual(s) must be removed, it is likely that WS would be asked by the Recovery Team to initiate PDM activities to abate damages caused by the offending wolf or wolves. This would be completed for USFWS under separate NEPA documentation and the appropriate permit.

Wolverine. Wolverines may have been extirpated from Colorado and WS has not taken any in the last few decades. If WS personnel sight a wolverine, or verify tracks or other sign, CDOW will be notified. In the immediate area of a wolverine identified by WS or CDOW, WS could still use padded jaw leghold traps and snares with stops checked daily, but not M-44s. WS will determine further measures that will reduce the potential for take with CDOW if one is found.

California Condor. If a California condor is seen in Colorado outside of the designated experimental range in Arizona, WS will implement the reasonable and prudent alternatives identified by USFWS in their 1992 BO (USDA 1997, Appendix F) to protect the condor. Currently, M-44s are not used in a 5 mile corridor around Colorado and San Juan Rivers from March 1 to October 1. Three condors were seen near Grand Junction in the summer of 1998 (USFWS 2001).

Bald Eagle. A bald eagle is a primary T&E species of concern in Colorado covered by the 1992 BO (USDA 1997). WS has adopted and implemented all reasonable and prudent alternatives and measures and their terms and conditions to protect bald eagles that were identified by USFWS in their 1992 BO (USDA 1997, Appendix F). In accordance with WS policy, WS will not place any leg-hold traps, M-44 or land restraint snares within 30 feet of any exposed bait or animal carcass (except for those used to trap mountain lions). When eagles are present in the immediate vicinity of a proposed PDM project, daily searches will be made for carcasses or trapped individuals. In accordance with WS policy, all spring-activated foot-snares and leg-hold traps, set on land, will have pan-tension devices, unless such use would preclude capture of the intended target animal. Pantension devices reduce or eliminate the likelihood that eagles or smaller nontarget species could be captured by the foot-snare.

Concern has arisen regarding lead poisoning from bald eagles scavenging predators that have been shot. The WS Program has tried various nontoxic (non-lead) shot loads to reduce the concern of lead poisoning, however there is some evidence that the lead threat is not as severe as previously thought. Hayes (1993) reviewed literature and analyzed the hazard of lead shot to raptors. Key findings of that review were:

- Eagles are known to scavenge on coyote carcasses, particularly when other food sources are scarce or when food demands are increased.
- In studies that documented lead shot consumption by eagles (i.e., based on examining the contents of regurgitated pellets), the shot was associated with waterfowl, upland game bird, or rabbit remains, and was smaller than BB or #4 buckshot used in aerial hunting. Lead levels have been detected in eagle blood samples, but the source of the exposure was unknown. Lead residues have been documented in black-tailed jackrabbits, voles (*Microtus sp.*), and ground squirrels which can explain how eagles could ingest lead from sources other than lead shot. In one study (Pattee et al. 1981) four of five captive bald eagles force fed noncoated lead shot died and the fifth went blind. Frenzel and Anthony (1989) suggested, however, that eagles usually reduce the amount of time that lead shot stays in their digestive systems by casting most of the shot along with other indigestible material. It appears that healthy eagles usually regurgitate lead shot in pellet castings which reduces the potential for lead to be absorbed into the blood stream (Pattee et al. 1981; Frenzel and Anthony 1989).
- WS personnel examined nine coyotes shot with copper plated BB shot to determine the numbers of shot retained by the carcasses. A total of 59 shot pellets were recovered, averaging 6.5 pellets per coyote. Of the 59 recovered pellets, 84% were amassed just under the surface of the hide opposite the side of the coyote that the shot entered, many exhibited minute cracks of the copper plating, and two shot pellets were split. The fired shot were weighed and compared with unfired shot and were found to have retained 96% of their original weight. Eagles generally peel back the hide from carcasses to consume muscle tissue. Because most shot retained by coyotes tends to end up just under the hide, it would most likely be discarded with the hide. Any shot consumed would most likely still have the nontoxic copper plating largely intact, reducing the exposure of the lead to the digestive system. These factors, combined with the usual behavior of regurgitation of ingested lead shot indicate a low potential for toxic absorption of lead from feeding on coyotes killed by aerial hunting.
- Bald eagle populations appear to be increasing in the contiguous 48 states and have met or exceeded recovery goals in several states. Golden eagle populations appear to be healthy. Breeding Bird Survey Data indicate a general increasing trend in breeding populations of both golden and bald eagles in North America since 1966 (Sauer et al. 2004). Thus, eagle populations do not appear to be adversely affected by toxicity problems.

The above analysis indicates adverse effects on eagles from scavenging on coyotes killed by aerial hunting are unlikely. The USFWS did not identify this as a concern in the 1992 BO (USDA 1997) which covered potential adverse effects on bald eagles from all WS used WDM methods, including shooting.

Burrowing Owl. WS employees using gas cartridges to fumigate a coyote or red fox den will ensure that dens are occupied by the target species and not burrowing owls.

Plains Sharp-tailed Grouse, Lesser Prairie-chicken, and Gunnison's Sage-grouse. WS will use pan-tension devices on leghold traps in habitat occupied by these grouse species to minimize their potential capture. Small predators will be live captured in cage traps in order to target mammalian predators of the same weight as these sensitive species.

Measures to Ensure Minimal Impacts from Aerial Hunting Overflights

WS pilots will abide by the WS Aviation Policy Manual and Federal Aviation Regulations. Nontarget wildlife will not be pursued and when seen will be avoided. For example, if coyotes are the target species and a coyote is seen in the vicinity of a lek, the coyote might be taken, but the crew would definitely leave the area as soon as possible; the coyote would likely disrupt the lek much more than the airplane. WS has had no reports of impacts to wildlife from aerial hunting overflights.

3.4.2.3 Impacts on Public Safety, Pets, and the Environment.

 A formal risk assessment (USDA 1997, Appendix P) concluded that hazards to the public from PDM devices and activities are low.

- Public safety zones are delineated and defined by location or on WP maps by BLM and USFS during the WP review phase, as changes make them necessary. The public safety zone is one-quarter mile, or other appropriate distance, around any residence or community, county, state or federal highway, or developed recreation site. PDM conducted on federal lands within identified public safety zones will generally be limited to activity aimed at the protection of human health and safety. However, a land management agency or cooperator could request PDM activities in the public safety zone for an identified need. Depending on the situation and applicable laws and regulations, WS could provide the service. However, land management agencies would be notified of PDM activities that involve methods of concern such as firearms and dogs before these methods would be used in a public safety zone, unless specified otherwise in the WP and deemed appropriate.
- All pesticides are registered with EPA and CDA. WS employees will comply with each pesticide's directions and labeling, in addition to EPA and CDA rules and regulations.
- WS Specialists who use restricted use chemicals (i.e., pesticides or drugs) are trained and certified by program personnel or other experts in the safe and effective use of these materials under EPA and CDA approved programs. WS employees who use chemicals participate in continuing education programs to keep abreast of developments and to maintain their certifications.
- M-44's are only used by those WS personnel who are trained and have received state certification from CDA to use sodium cyanide. PDM activities that involve the use of these chemicals are conducted in accordance with CDA and federal EPA regulations and label restrictions (USDA 1997 Appendix Q).
- Conspicuous, bilingual warning signs alerting people to the presence of traps, snares, and M-44s are placed at major access points when they are set in the field.

3.4.2.4 Effects of PDM, especially Aerial Hunting Activities, on the Use of Public Lands for Recreation.

- WS would conduct PDM on SMAs only when and where a need exists and is requested. All PDM activities conducted in SMAs including WAs and WSAs would be in accordance with the MOUs between WS and other agencies, and all enacted rules and regulations that are applicable to WS.
- WS personnel follow all laws and regulations applicable to WS and use the WP guidelines while conducting PDM activities on public lands. The WPs include delineation of areas where certain methods may not be used during certain time periods when conflicts with recreational events may occur. If it were necessary to work in areas outside the planned area, the area manager or their representative would be contacted in a timely manner.
- WS conducts PDM in accordance with all laws applicable to WS associated with public lands and for the areas specified in BLM RMPs and USFS LRMPs. The land managing agencies review the WPs for consistency with their Plans.
- Vehicle access would be limited to existing roads, unless off-road travel is specifically allowed by the land managing agency and conforms with RMPs and LRMPs.
- PDM in WAs would be in accordance with Wilderness Policies and MOUs applicable to WS PDM activities.
- WS does not anticipate conducting PDM in National Parks. The potential exists that a request could come from the National Park Service or CDOW for responding to a threat to human health and safety or for research

purposes.

- Should any of BLM's existing WSAs be officially designated as Wilderness Areas in the future, WDM would be performed in accordance with the enacting legislation and Wilderness rules and regulations that pertain to WS PDM.
- Should any of BLM's existing WSAs be officially dropped as a WSA, PDM would follow standard procedures for public lands and as specified in the WP.

3.4.2.5 Humaneness of Methods Used by WS.

- Chemical immobilization and euthanasia procedures that do not cause pain or undue stress are used by certified personnel when practical and where safe.
- WS personnel attempt to kill captured target animals that are slated for lethal removal as quickly and humanely as possible. In most field situations, a shot to the brain with a small caliber firearm is performed which causes rapid unconsciousness followed by cessation of heart function and respiration. A well placed shot to the head is in concert with the American Veterinary Medical Association's (1987) definition of euthanasia (Beaver et al. 2001). In some situations, accepted chemical immobilization and euthanasia methods are used.
- Traps are set and inspected according to CDA or CDOW regulations and WS policy.
- Research continues with the goal of improving the humaneness of PDM devices.
- WS take is monitored. Total animal take is considered in relation to the estimated population numbers of key species. These data are used to assess cumulative effects of harvest so as to maintain the level of harvest below that which could impact the viability of a population.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides the information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose of the proposed action. This chapter analyzes the environmental consequences of each alternative discussed in Chapter 3 in relation to the issues identified for detailed analysis in Chapter 2. Each of the alternatives is compared to the proposed action for each issue to determine if real or potential impacts are greater, lesser, or remain about equal.

4.1 ISSUES ANALYZED IN DETAIL

NEPA requires federal agencies to determine whether their actions have a "significant impact on the quality of the human environment." The environmental consequences of the 5 alternatives are discussed below with emphasis on the issues presented in Chapter 2. The comparison of alternatives will be used to make a selection of the most appropriate alternative for WS PDM activities in Colorado. The alternatives selected for detailed assessment provide the best range of alternatives that could potentially meet the purpose and the need of PDM in Colorado as identified in Chapter 1.

4.1.1 Effects on Target Predator Populations

To adequately determine the magnitude of impacts in relation to predators and their populations, WS data and cumulative take will be analyzed. The authority for management of resident wildlife species has traditionally been a responsibility left to the states. CDA and CDOW are the State agencies that manage damage caused by resident wildlife. CDOW is the state agency with hunting and sport trapping management responsibility for animals classified by state law as protected game or furbearers. CDOW provided statistics on take, but could not provide definitive estimates of population sizes for most species (except black bears and mountain lions). Therefore, WS used the best available information to produce reasonable, but conservative estimates of WS impacts on species populations. Estimates of the predator populations were made in Section 2.2.1.

An aspect, perhaps overriding, that is germane to the determination of "significance" under NEPA is the effect of a federal action on the *status quo* for the environment. The States have the authority to manage populations of resident wildlife species with the exception of migratory and T&E species as they see fit without oversight or control by federal agencies. Management direction for a given species can vary among states, and state management actions are not subject to NEPA compliance. Therefore, the *status quo* for the environment with respect to state-managed wildlife species is the management direction established by the States. Federal actions that are in accordance with State management have no effect on the *status quo*. Wildlife populations are typically dynamic and can fluctuate without harvest or control by humans. Therefore, the *status quo* for wildlife populations is fluctuation, both within and among years, which complicates determining the significance of human impact on such populations.

4.1.1.1 Alternative 1 - Continue the Current Federal PDM Program. Under the current program alternative, take by WS and others will be considered statewide providing a more comprehensive picture of impacts to predators. The 2 prior EAs and supplement (WS 1997b, 1999a, and 2001) determined that PDM had no significant impacts to predators in western or eastern Colorado. This EA has been expanded to include the entire state to determine the magnitude of impacts at this level. The statewide level provides a more comprehensive and statistically sound look at cumulative impacts because take by sportsmen and others in Colorado is statistically more credible on a statewide scale. Additionally, greater consistency of WS policies for PDM would allow easier application by WS Specialists.

The Colorado Wildlife Commission, CDOW, and CDA have been given management authority over resident wildlife and their damage (CRS Title 33 and 35) via the State's system of representative government. That system was established to represent the *collective desires* of the people of the State of Colorado with respect to the management of certain wildlife species. In this way, the State determines its desires for that component of the human environment which is comprised of resident wildlife species. The federal WS program recognizes and honors the right of the state of Colorado to manage resident wildlife species. WS therefore has a policy of abiding by applicable state laws and works cooperatively with the State's wildlife management agencies to assure WS's impacts on resident wildlife species are

within those desired by the State.

PDM targets specific species and cumulative effects on populations of those species as a result of PDM activities and other actions are analyzed to determine the relative significance of impacts. In addition, management direction from the responsible agency (CDA and CDOW) is a determining factor. For example, CDOW may want to reduce a specific predator population. A declining population of a resident wildlife species does not necessarily equate to a "significant impact" as defined by NEPA if the decline is condoned or desired by the management agency (CDOW manages most predators as discussed in Section 1.1) representing the people that live in the affected human population. It is reasonable and proper to rely on the representative form of government within a state as the established mechanism for determining the "collective" desires or endorsements of the people of a state. WS abides by this philosophy and defers to the collective desires of the people of the State of Colorado by complying with applicable State laws and regulations that govern the take or removal of resident wildlife. The analysis herein indicates predator populations are not being impacted to the point of causing a substantial decline. If at some point in the future they are negatively impacted, then such a decline would not constitute a "significant" impact as defined by NEPA so long as the actions that cause the decline are in accordance with the responsible management agency's goals and objectives, with applicable State law, and concomitantly, with the collective desires of the people of the State.

From a NEPA standpoint, justification for a finding of "no significant impact on the quality of the human environment" with respect to WS's take of most predators in Colorado is the fact that WS's involvement has no adverse effect on the status quo because, if WS was not available, under CDOW or CDA authority, virtually the same predators that are killed by WS would be taken by other agency or private actions. Other agency personnel believe that WS's involvement actually benefits their ability to control most predator species mortality by encouraging livestock owners to rely on government assistance in resolving depredation problems instead of killing predators themselves as allowed under state law. This suggests that, if WS stopped its involvement in most predator management in the State, there would be virtually no change in environmental effects or in cumulative environmental effects. Additionally, land owners that are given assistance with damage problems are much more likely to have a favorable view of wildlife (International Association of Fish and Wildlife Agencies 2004)

A "viable" population can exist at many levels between one that is at carrying capacity (the maximum number of a species that a particular habitat can support) and one that is at only a fraction of carrying capacity. Because rates of increase are density dependent (i.e., the population grows at a faster rate as the population is reduced in relation to carrying capacity), predator populations have the ability to recover from declines that might result from mistakes in management. History has born this out by the fact that efforts in the early half of the 20th century to eradicate some of the predator species being discussed (i.e., coyotes, black bears, and mountain lions) failed to do so. However, the larger predators' numbers were most likely reduced substantially (Evans 1983). Density dependent rates of increase are a built-in mechanism of most wildlife populations that serve to reduce effects of population reductions whether by harvest, localized control, or non-man-induced mortality. This provides additional assurance that a viable population would be maintained in the State, even if a sustainable harvest rate is exceeded in the short term in areas where the objective is to maintain the population.

The methods used by WS to take target predators under the current program are the same as those that have been used in recent years and were described in Section 3.2.1.2 and prior EAs (WS 1997b, 1999a, and 2001). The methods used in each damage situation depend on the species causing the damage and other factors including location (public versus private lands), weather, and time of year as discussed in section 3.2. The methods include frightening devices, regular and padded-jaw leghold traps, cage traps, neck and foot snares, shooting, calling and shooting, aerial hunting, net guns, hunting dogs, M-44s (sodium cyanide), and denning (gas cartridge). Other methods may be used, but most of these would be incorporated by the resource owner.

WS conducts PDM annually for 6 primary predator species in Colorado, but could have the potential for dealing with several (13 species in last 5 FYs -Table 1). These species are listed in Section 1.2 with general information about them and which agency, WS, CDA, or CDOW, has primary responsibility for responding to damage complaints that involve these species. The primary target species taken yearly in Colorado are coyotes, red fox, striped skunks, black-bears,

raccoons, feral dogs, and, to a lesser extent, mountain lions and bobcats. It should be noted that actually few mountain lions and bobcats are taken by WS annually, but are included because their populations have higher hunting pressure. Most other target predators are taken by WS only on an occasional basis, if at all. All target predators taken from FY00 to FY04 by WS in Colorado are presented in Table 16. Of the average target take from FY00 to FY04, coyotes represented 94.3%, red fox 1.7%, striped skunks 1.5%, black bear 1.0%, raccoons 0.7%, feral dogs 0.6 % and all others 0.3%.

Table 16. All target predators taken by WS during PDM for FY00 to FY04 on all land classes.

	70.50	T:	arget Pre	dator Sp	oecies Tal	ken by V	VS in FY	00-FY04		100		11.54
YEAR	FY	00	FY	701	EY	02	FY	03	EY	704	Ave	rage
Species	Killed	Freed	Killed	Freed	Killed	Freed	Killed	Freed	Killed	Freed	Killed	Freed
Coyote	3,351	- 1	3,527	-	3,308	-	2,408	-	2,705	3*	3,060	1
Red Fox	63	- "	68	-	63	-	28	-	48	1*	54	0
Striped Skunk	98	-	33	-	34	-	31	-	51	-	49	0
Black Bear	37	-	28	-	52	6	8	-	28	-	31	l
Raccoon	21	l	7	3	15	-	21	1	44	-	22	1
Feral Dog	36	-	45	3	14	-	6	-	1	-	20	ł
Mountain Lion	2	2	6	-	4	-	6	-	4	3	4	1
Bobcat	2	-	4	-	3	-	5	-	6	-	4	0
W. Spotted Skunk		-	l	-	2		-	-	-	-	1	0
Badger	-	-	-	-	-	-	-	-	2	-	0	0
Gray Fox	-		2	-	-		-	-	-	-	0	0
Feral Cat	-	-	-	-			-	-	1	9	0	2
Opossum	1	1	-	-	-	-	-	-	-	-	0	0
Total	3,610	3	3,721	6	3,495	6	2,513	I	2,889	7	3,246	5

^{*} hazed with frightening devices at airport

Table 17. Actual or estimated furbearers and big game taken during the 1999-00 to 2003-04 small and big game hunting seasons (L. Stevens, CDOW, *unpubl. data* 2005, CDOW 2005a).

Year	1999.	-00	2000-	01	2001	-02	2002-	03	2003	-04	Avera	ige
Species	Harvest	SE*	Harvest	SE*	Harvest	SE*	Harvest	SE*	Harvest	SE*	Harvest	SE*
Badger	143	0	65	-0	697	3	158	0	159	0	244	1
Black Bear**	983	• 11	818	-	759	-	857	-	603	-	804	-
Bobcat**	258	- 2	321	- 2	409	4.5	520	-	446		391	-
Coyote	25,920	186	21,058	146	34,413	358	39,610	2,114	45,912	3,152	33,383	1,191
Red Fox	520	0	340	0 -	1,540	8	1,517	4	997	1	983	3
Mountain Lion**	473		318	1	439	-	372	-	370		394	-
Raccoon	1,054	2	373	0	3,703	102	2,777	14	2,153	9	2,012	25
Striped Skunk	872	2	437	1	1,668	9	2,482	37	896	2	1,271	10

^{*}Standard Error - statistical measurement - 95% confidence interval (Harvest±2 SE) is the range that this estimate will be accurate 95% of the time.

** Not estimated because mandatory check

Table 18. Furbearers taken as depredating animals from 1999 to 2003 seasons (L. Stevens, CDOW, unpubl. data 2005).

	Eurbearers Trapp	ed for Depredatio	n during Calenda	ır Years in Colora	do and Ave. Tak	e
Species	1,999	2,000	2,001	2,002	2,003	Ave. Take
Badger	N/A	0	52	2	2	14 %

ig S. G. San	Furbearers Trapp	ed for Depredati	on during Calend	ar Years in Color	ado and Ave. Tak	e
Bobcat	15	36	50	124	291	100
Coyote	N/A	16	86	259	196	139
Red Fox	N/A	6	17	28	20	18
Raccoon	N/A	0	0	2	2	1
Fotal Permitted	15	58	205	415	511	272

For the purpose of conducting comparative and cumulative impacts analyses, the furbearers taken in Colorado during the 1999-00 to 2003-04 fur seasons (Table 17) and furbearers trapped per Amendment 14 (Table 18) are given. Fur harvest often reflects the value of the fur, the relative abundance of the species, and the number of sportsmen involved in harvesting. Harvest pressure during the late 1970s and early 1980s was much greater because of the high value of fur and, thus, a higher number of sportsmen in the field. Furbearers trapped for depredation mostly reflect the species that cause frequent damage and cannot be taken easily by alternative means (i.e., coyotes do not need a special permit to take them by shooting, but bobcats do).

Coyote Population Impact Analysis. Coyotes are the species most frequently targeted by WS in Colorado, primarily because they are WS's responsibility and because they have a propensity to cause problems. As a result, this species makes up the largest percentage of the predator take (94.2%). Additionally, they were responsible for the majority of requests for assistance (61%) and damage value (77%). The coyote population in Colorado was estimated to be 104,000 (Section 2.2.1.1). This estimate will be used to determine impacts (Table 19).

Table 19. Cumulative coyote kill in Colorado for WS and private harvest for FY00 to FY04.

	СОУОТ	E IMPACT ANA	LYSIS		
	FY00	FY01	FY02	FY03	FY04
Est. Population	104,000	104,000	104,000	104,000	104,000
WS Take	3.351	3,527	3,308	2,408	2,705
Sportsmen Harvest (UCI)*	26,292	21,350	35,129	43,838	52,090
Est. # of Coyote Hunters in Colorado	6,285	5,475	7,504	8,965	9,581
Depredation & Other Take	0	16	86	259	196
Total Take	29,643	24,893	38,523	46,505	54,991
WS Take - % of Pop.	3.2%	3.4%	3.2%	2.3%	2.6%
Total Take - % of Pop. population	28.5%	23.9%	37.0%	44.7%	52.9%
Long-term Sustainable Harvest Level	60%	60%	60%	60%	60%

^{*} UCl = Upper 95% confidence interval from Table 17 (Harvest+2 SE)

WS took an average of 3,060 coyotes annually from FY00 to FY04 with a high of 3,527 in FY00 representing about 3% of the estimated coyote population. The estimated sportsman harvest about doubled from FY00 to FY04. This increase most likely reflects more hunters in the field (Table 19) and a probable increase in fur prices. WS's take numbers are similar to levels analyzed in previous EAs (WS 1997b, 1999a, 2001), but private harvest is higher than previously reported. Additionally, private depredation take began in FY01 and has increased from FY01 to FY04. FY04 had the highest combined take, about 55,000, and represents the greatest impact on the coyote population.

A population model developed by Pitt et al. (2001) assessed the impact of removing a set proportion of the coyote population in one year and then allowing the population to recover (referred to as "pulse removal"). In the model, all populations recovered within 1 year when <60% of the population was removed. The population recovered within 5

years when 60-90% of the population was removed. Pitt et al. (2001) stated that actual coyote populations would recover even more quickly than the model indicated, because the model assumed coyote territories were retained even at low densities, that animals would not move out of their territories to mate, and that animals were not allowed to move in from surrounding areas (no immigration). The model also did not allow for a reduction in natural mortality rates at low population densities. Pitt et al. (2001) also evaluated the impact of removing a set proportion of the population every year for 50 years (sustained removal). When the removal rate was <60% of the population, the population size was the same as for an unexploited population. However, a shift in population structure was noted. For example, the population with 50% removal had fewer transient animals, a younger age structure, and higher reproduction. Sustained removal rates of >70% of the population resulted in removal of the entire population after 7 years, but the authors acknowledged that annual removal of 70% of the population would become increasingly difficult at low densities. Because of the model limitations described above for pulse removal, natural populations are probably able to withstand greater levels of harvest than indicated by Pitt et al. (2001). These findings are consistent with an earlier model developed by Connolly and Longhurst (1975), and revisited by Connolly (1995) which indicated that coyote populations could withstand an annual removal of up to 70% of their numbers and still maintain a viable population. This conclusion is consistent with the U.S.

General Accounting Office (1990) assessment that WS's impacts on coyote populations in the western United States can result in rapid occupancy of vacant territories (Windberg and Knowlton 1988). While removing animals from small areas at the appropriate time can protect vulnerable livestock, immigration of coyotes from the surrounding area quickly replaces the animals removed (Stoddart 1984). Connolly (1978) noted that coyotes have survived and even thrived in spite of early 20th century efforts to exterminate them. Based on this information, WS's impact on the coyote population in Colorado, even with possible underreporting of "Other Harvest", would not affect the general coyote population because the "Total Take" of coyotes in the area is currently less than 60% of the estimated population. Evaluating the data using standards established in USDA (1997) to determine the level at which total harvest could start to impact the species, WS found a cumulative harvest of less than 75% of the allowable harvest level of 70% of the population of coyotes results in a

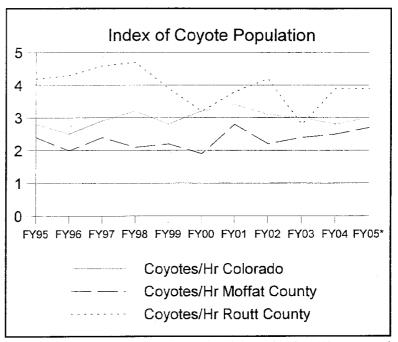


Figure 6. Coyotes taken per hour of aerial hunting by WS personnel provide an index of the coyote population trend in Colorado, and 2 Counties (Moffat and Routt). (* FY05 includes only 6 months of data).

determination of "low magnitude." Thus, a "low magnitude" impact rating is achieved if no more than 52.5% of the population is taken per year. Based on the above analysis, the expected cumulative harvest rate of the coyote population in Colorado is within the "low magnitude" criteria used by USDA (1997).

The analysis further suggests annual coyote take could *conservatively* be increased by about 7000 per year before the 60% allowable harvest level would be reached. Therefore, it is reasonable to conclude that cumulative impacts on coyote populations in general within Colorado are not substantial and would remain so even if WS's lethal coyote damage management efforts were increased more than two-fold, depending on the level of take from sportsmen.

Another indicator, or index, of the status of the coyote population is to look at the number of coyotes taken per hour of aerial hunting; over the course of the year, the same percentage of hours are flown in similar months with the highest

number of hours coinciding with lambing and calving in the spring. This gives a relative index of the coyote population and whether or not, over time, the population is decreasing, stable, or increasing. From FY95 to FY05, the coyote population in Colorado, and in Moffat and Routt Counties where a majority of WS's aerial hunting activities occur, appear to have been fairly stable with normal fluctuations occurring between years (Figure 6). This provides additional supporting evidence that cumulative impacts on coyote populations have not been great enough to cause any declines in Colorado or in Counties where WS conducts much of its aerial hunting.

Another consideration in terms of determining WS's effect on the "environmental status quo" is that WS's coyote take averages only about 8% of total estimated coyote take in the State (Table 19). Therefore, we would expect at least 92% of current coyote take levels to continue, even if WS were to discontinue lethal coyote take. It is also likely that private coyote control efforts would increase if WS assistance were to be reduced or discontinued. Therefore, coyote take levels may not change much from current levels if WS were to discontinue lethal coyote take.

Fox Populations Impact Analyses. The majority of requests for assistance for fox-related damage is for incidents involving the red fox. An average of 24 requests per year were received for them from FY00 to FY04. WS received an average of one complaint annually for gray fox and none for kit or swift fox from FY00 to FY04 (Table 1). WS took an average of 54 target red fox in Colorado, 1.7% of the total WS target predator take from FY00-FY04 (Table 16). WS took an average of 4 red fox as nontargets from FY00 to FY04 (Table 6). CDOW reported an average of 1,573 taken by sportsmen (Table 17) and under depredation (Table 18) by private individuals (L. Stevens, CDOW, unpubl. data 2005). An allowable harvest for red fox is 70% of the total population(USDA 1997) or 73,000 per year of the estimated 104,000 (Section 2.2.1.2). Therefore, WS take (0.1% at most) and cumulative take (1.8% in FY02 at the highest) is clearly inconsequential and could increase substantially before any impact on the population would occur (Table 20). Prior to the ban on recreational trapping, sportsmen took an average of 2,275 (Table 5).

Table 20. Cumulative red fox kill in Colorado for WS (target and nontarget) and private harvest from sportsmen and depredation permits for FY00 to FY04.

	RED	FOX IMPACT A	NALYSIS		
	FY00	FY01	FY02	FY03	FY04
Est. Population	94,000	94,000	94,000	94,000	94,000
WS Take	63	70	63	28	50
Sportsmen Harvest (UCI)*	520	340	1,573	1,525	999
Depredation & Other Take	0	6	17	28	20
Total Take	583	416	1,653	1,581	1,069
WS Take - % of Pop.	0.1%	0.1%	0.1%	0.0%	0.1%
Total Take - % of Pop.	0.6%	0.4%	1.8%	1.7%	1.1%
Allowable Harvest Level	70%	70%	70%	70%	70%

^{*} UCI = Upper 95% confidence interval from Table 9 (Harvest+2 SE)

WS rarely takes gray fox in PDM and took only 2 targets in FY01 (Table 16) and I nontarget in each of FY01 and FY02 (Table 6). Thus, the highest take in any year by WS from FY00 to FY04 was 3. The population of gray fox was estimated at 36,000 for Colorado (Section 2.2.1.2). An acceptable harvest rate for gray fox is 25% or 9,000 (USDA 1997). Clearly, the take of three would not impact the population and WS could increase PDM for gray fox substantially before any impact to the population would occur. The gray fox hunting season was closed in 1990 and trapping was banned in 1996. Prior to these closures, sportsmen took an average of 660 annually (Table 5) which further illustrates the current low rate of take.

WS did not take a target swift fox or kit fox from FY00 to FY04. WS rarely takes these species as targets in PDM activities because they generate few complaints. Nationally, a few kit fox were taken as target species in FY01 and FY02. This indicates that they can infrequently become a problem. WS did take 5 nontarget swift fox, 1 in FY01 and 4 in FY03 (Table 6), but no kit fox. No private harvest occurred during this time because the hunting and trapping

seasons were closed for these species in 1990 and 1995. However, CDOW captured 30 swift fox in 2003 and 28 in 2004 for a transplant program to South Dakota (L. Stevens, CDOW, *unpubl. data* 2005) which was the highest cumulative take in recent years. Prior to the closures, private harvest averaged 1,004 for swift fox and 13 for kit fox (Table 5). In 1987, over 2,200 swift fox and 41 kit fox were harvested (possibly 101 kit fox in 1991 - this figure could be high since it is an estimate of harvest). A sustainable harvest has not been determined for swift or kit fox. If 25% of the population could be taken without adversely impacting the population, it is perceivable that 2,275 swift fox and 30 kit fox could be harvest from the estimated populations of 9,100 swift fox and 130 kit fox (Section 2.2.1.2). However, WS PDM has had virtually no impact on either species because there has been little take. Take would have to increase substantially before an impact would occur. Any take of target kit fox would be coordinated with CDOW as appropriate, since it is a State listed endangered species.

Skunk Populations Impact Analyses. The majority of requests for assistance for skunk-related damage is for striped skunks. WS rarely receives complaints for eastern and western spotted skunks, and hog-nosed skunks. The striped skunk population was estimated at 88,400 (Section 2.2.1.3). WS took an average of 49 target striped skunks in Colorado which is 1.5% of the total WS target predator take from FY00-FY04 (Table 16). Additionally, WS took an average of 3 striped skunks as nontargets during PDM from FY00-FY04 (Table 6). Sportsmen take is much higher and was highest in 2003-04 at 2,556 (Table 17). This coincided with the highest cumulative take of 3.1% of the estimated population (Table 21). Skunk populations can reportedly sustain a 60% annual harvest level indefinitely (Boddicker 1980). USDA (1997) did not determine a definitive harvest level. Because this level of harvest is substantially less than the potential sustainable harvest level, cumulative impacts are likely of a very low magnitude.

Table 21. Cumulative striped skunk kill in Colorado for WS (target and nontarget) and private harvest from sportsmen and depredation permits for FY00 to FY04.

	STRIPEI	SKUNK IMPAC	CT ANALYSIS		
	FY00	FY01	FY02	FY03	FY04
Est. Population	88,400	88,400	84,000	84,000	84,000
WS Take	99	36	36	31	59
Sportsmen Harvest (UCI)*	876	439	1,686	2,556	900
Depredation & Other Take	0	0	0	0	0
Total Take	975	475	1,722	2,587	959
WS Take - % of Pop.	0.1%	0.0%	0.0%	0.0%	0.1%
Total Take - % of Pop.	1.1%	0.5%	2.1%	3.1%	1.1%
Allowable Harvest Level	60%	60%	60%	60%	60%

^{*} UCI = Upper 95% confidence interval from Table 17 (Harvest+2 SE)

Spotted skunks are not often the target of PDM and WS took 3 western spotted skunks from FY00 to FY04. Hunting and trapping seasons for the spotted skunk have been closed since 1995. Prior to the season closure, an average of 98 western and 3 eastern spotted skunks were harvested by trappers annually from 1987 to 1994 (Table 5). Cumulative impact for the two species of skunk has been 2 western spotted skunks from FY00 to FY04. Both were taken by WS in FY02 (Table 16). Compared to the historic take, and with an estimated population of 26,500 western spotted skunks and 2,650 eastern spotted skunks (Section 2.2.1.3), the magnitude of cumulative take can be considered extremely low.

The hog-nosed skunk has not generated any damage complaints. If WS took one, it would most likely wander into Colorado from New Mexico where the species is common. It is possible that an extant population exists in Colorado and is not generating damage complaints due to the hog-nosed skunk's habitat preference for rocky canyons. If so, the population would likely number at least a few hundred individuals and limited take would not impact the population as a whole. If hog-nosed skunks expanded their range form New Mexico into Colorado, the impact would be minimal because New Mexico's population of hog-nosed skunks is healthy enough to withstand some level of harvest (BISON-M 2004). Therefore, WS concludes that, although unlikely, in the event that a hog-nosed skunk is taken, it would not impact the overall population of hog-nosed skunks in their range.

Black Bear Population Impact Analysis. The second most number of requests for assistance for black bears in Colorado is for black-bear-related damage. An average of 179 requests for assistance were received by WS from FY00 to FY04 (Table 1). Black bear numbers are moderately high in forested areas of the western half of the State. Prior to 1935, when black bears were given game status in Colorado, they were considered a pest. In 1992, Colorado voters approved Amendment 10, which banned spring bear hunting and outlawed the use of dogs and bait. Following the passage of the bill, bear hunting success declined first declined and then increased to an even higher rate of success. This suggests the bear population has increased. The estimated population for Colorado of 10,000-12,000 (CDOW 2004) is likely a very conservative estimate (J. Apker, CDOW, pers. comm 2005). For the sake of estimating alternative impacts, the lower number will be used. This equates to a density of 0.15 bears/mi² in western Colorado, or half the low density estimate for black bears. WS maximum take from FY00 to FY04 was 52 in FY02 or 0.5% of the population (Table 16). The highest cumulative take also occurred in FY02 with 1,269 or 12.7% of the population, about 65% of the allowable harvest (Table 22). The allowable harvest for black bears is 20% of the population (USDA 1997). With a population estimate of 10,000, a cumulative take of 2,000 bears would have to be taken before take would be considered of moderate magnitude. Therefore, WS's impacts on the black bear population in Colorado is minor and cumulative take could double before an impact were probable. CDA has responsibility for black bears damaging agriculture and CDOW has decision authority over the take and disposition of black bears damaging other resources in Colorado. WS has agreements with CDA and CDOW to respond to many black bear complaints. CDOW monitors the black bear population closely and provided the data for this analysis (J. Apker, CDOW, pers. comm. 2005). Since CDOW monitors the bear population closely, and adjusts management objectives according to the State's goals and objectives, WS has no ability to affect the number of black bears taken statewide. WS notifies CDOW where and when black bears were taken to provide CDOW information on the data analysis unit (DAU). DAUs are areas within the State that encompass a subpopulation of a species such as black bear or mountain lion. DAUs are larger than the game management units designated by CDOW for other species that less mobile.

Table 22. Cumulative black bear kill in Colorado for WS (target and nontarget) and private harvest from sportsmen and depredation permits for FY00 to FY04.

	BLACI	K BEAR IMPACT	ANALYSIS	· · · · · · · · · · · · · · · · · · ·	
	FY00	FY01	FY02	FY03	FY04
Est. Population	10,000	10,000	10,000	10,000	10,000
WS Take	37	28	52	8	28
Sportsmen Harvest	820	759	860	603	505
Other Take/Mortality *	206	245	357	105	191
Total Take	1,063	1,032	1,269	716	724
WS Take - % of Pop.	0.4%	0.3%	0.5%	0.1%	0.3%
Total Take - % of Pop.	10.6%	10.3%	12.7%	7.2%	7.2%
Allowable Harvest Level	20%	20%	20%	20%	20%

^{*} Other mortality includes non-WS depredation take, road kills, etc.

CDOW has management objectives for all DAUs in Colorado (19 DAUs for black bear) (J. Apker, CDOW, pers. comm. 2005). Each DAU has hunter harvest and non-hunter mortality objectives as well as objectives for total take and percent female take. CDOW uses 3 to 5 year averages to estimate mortality (hunter and non-hunter), determine the harvest potential for a DAU based on the estimated population for that DAU, and to set the next season's license recommendations accordingly. WS take is incorporated into the CDOW analyses. Therefore, WS is not additively impacting the population since CDOW uses WS take information to determine the impact of take for each DAU. CDOW can reduce the number of licenses available where they suspect the population to have been adversely impacted or increase licenses in DAUs where the population is higher than the desired objective. In addition to lethal take, WS did take and relocate 6 bears in FY02 (Table 16). This action did not impact the population.

Justification for a finding of "no significant impact on the quality of the human environment" with respect to WS's take of black bears in Colorado is the fact that WS's involvement has no adverse effect on the *status quo* because, if WS was

not available, CDOW or CDA would take, or issue permits to take, virtually the same bears that are killed by WS. Similar to mountain lion management, WS's involvement should actually *benefit* the ability of CDOW to control black bear mortality by encouraging livestock owners to rely on government assistance in resolving depredation problems. WS is more likely to target the correct bear whereas private resource owners may not kill the target bear as reliably. If WS stopped its involvement in black bear management in the State, there would be virtually no change in environmental effects or in cumulative environmental effects other than to potentially increase the number of bears taken by members of the public as allowed under state law.

Raccoon Population Impact Analysis. WS received 23 requests annually for raccoons from FY00 to FY04(Table 1). The raccoon population in Colorado has increase largely due to an increase manmade habitat. A conservative population estimate would be 135,000 (Section 2.2.1.5). In response to requests for assistance, WS takes an average of 22 raccoons each year (Table 16). Additionally, WS took an average of 3 nontarget raccoons from FY00 to FY04 (Table 6). During the same period, hunters took over 2,000 annually (Table 17). WS's maximum take from FY00 to FY04 was 47 in FY04, less than 0.1% of the population (Table 23). However, the highest cumulative take occurred in FY02 with 3,924 or 2.9% of the population. The allowable harvest level for raccoons was established at 49% of the total population (USDA 1997). WS take and cumulative impact is of low magnitude to the statewide raccoon population.

Table 23. Cumulative raccoon kill in Colorado for WS (target and nontarget) and private harvest from sportsmen and

depredation	permits	for	FY	00	to	F	Y04.	

	RACO	COON IMPACT A	NALYSIS		
	FY00	FY01	FY02	FY03	FY04
Est. Population	135,000	135,000	135,000	135,000	135,000
WS Take	21	14	17	24	47
Sportsmen Harvest (UCI)*	1,058	373	3,907	2,805	2,171
Depredation & Other Take	0	0	0	2	2
Total Take	1,079	387	3,924	2,831	2,220
WS Take - % of Pop.	0.0%	0.0%	0.0%	0.0%	0.0%
Total Take - % of Pop.	0.8%	0.3%	2.9%	2.1%	1.6%
Allowable Harvest Level	49%	49%	49%	49%	49%

^{*} UCI = Upper 95% confidence interval from Table 17 (Harvest+2 SE)

Feral Dog Impact Analysis. Feral and free-roaming dogs are somewhat common in Colorado. Requests for help with feral dogs are approved by the appropriate state or local agency as regulated by Colorado State laws. In response to a yearly average of 16 damage complaints involving dogs (Table 1), WS took an average of 20 target feral dogs during the period FY00 to FY04 (Table 16). WS also took 10 feral dogs incidental to PDM (8 released and 2 killed) (Table 6). Take of feral or free-ranging dogs by WS is considered to have little impact on the human environment since dogs are not an indigenous component of ecosystems in Colorado. In addition, the annual take of dogs by WS is minor in comparison to the thousands killed by animal control and humane organizations in Colorado each year. Therefore, no analysis of population impacts are given.

Mountain Lion Population Impact Analysis. Mountain lions generated the third greatest number of complaints in Colorado, 50 annually from FY00 to FY04 (Table 1), but few targets are taken in PDM. To resolve these complaints, WS killed an average of 4 mountain lions per year and relocated 1 from FY00 to FY04 (Table 16). During this same time period, hunters harvested an average of 394 lions annually (Table 17). WS also took 1 nontarget from FY00 to FY04, but it was released (Table 6). The cumulative impact on the mountain lion population was highest in FY00 at almost 11% (Table 24). Several studies of mountain lion population dynamics provide insights into sustainable harvest levels. The allowable annual harvest level for mountain lion populations, determined by the USDA (1997) was 30%. Ashman et al. (1983) found for their study in Nevada that under "moderate to heavy exploitation of 30%-50% removal" the lion population had the recruitment (reproduction and immigration) capability of rapidly replacing annual losses. Logan et al. (1996) determined the rate of increase in a New Mexico study varied from 8-11% in an unhunted,

uncontrolled population to 21-28% in a population where harvest and control was simulated by removing half of the lions from the study area. They concluded that rates of increase in mountain lion populations are density dependent; as a population declines in relation to carrying capacity, the rate of increase becomes greater. This is a natural mechanism of wildlife populations that serves to protect species by enhancing the ability of populations to recover from declines. Logan et al. (1996) suggested that, for a lion population to remain at or near maximum carrying capacity, no more than 11% of the adults should be harvested annually. It also suggested that, for a population managed for control, the harvest level might need to exceed 28% per year to cause the population to decline substantially. It appears that a viable population can be maintained at about 50% of carrying capacity with harvest levels that range from 21% to 28%.

Table 24. Cumulative mountain lion kill in Colorado for WS (target and nontarget) and private harvest from sportsmen for FY00 to FY04.

	MOUNTA	AIN LION IMPA	CT ANALYSIS		
	FY00	FY01	FY02	FY03	FY04
Est. Population	4,500	4,500	4,500	4,500	4,500
WS Take	2	6	4	6	4
Sportsmen Harvest	473	318	439	372	370
Total Take	475	324	443	378	374
WS Take - % of Pop.	0.0%	0.1%	0.1%	0.1%	0.1%
Total Take - % of Pop.	10.6%	7.2%	9.8%	8.4%	8.3%
Allowable Harvest Level	11%	11%	11%	11%	11%

Recent harvest of mountain lions in Colorado has been below the 11% level which would easily be sustainable for a population at or near carrying capacity. In fact, Logan et al. (1996) found that this level of harvest is less than a third of the level that should be sustainable by a population that is at half of carrying capacity. Data from Logan et al. (1996) also indicated that 89% of the adult plus subadult mountain lion in the San Andres Mountains in New Mexico were adults. Therefore, the percentage of adults in the sport harvest is assumed to be no more than 89%. However, this may be an overestimate. Available age data collected by the Arizona Game and Fish Department for lions harvested in Arizona from 1982 through 1987 showed that about 30% of the lions taken were young, or, presumably, subadult lions (WS 1999b). This suggests harvests from hunted or controlled populations may have a higher proportion of subadults. So assuming only 11% subadults in the overall Colorado harvest is probably lower than the actual number harvested. Further evidence that the cumulative harvest levels of past years have not affected the mountain lion population can be seen in records of historic sportsmen harvest (Table 5) which steadily increase from 180 in 1988 to a high of 473 in 2000 and have somewhat stabilized at this higher level. The fact that there have been enough lions to maintain total harvest at increasing levels for so long a period is strong evidence that the State's lion population has been near carrying capacity and able to withstand the levels of harvest and depredation take that have occurred. Therefore, from this evidence, it is assumed that WS has not had a cumulative impact on the mountain lion population in Colorado.

CDOW has management objectives for the 19 mountain lion DAUs in Colorado. Hunter harvest and non-hunter mortality objectives have been set. CDOW uses a 5 year average of harvest to estimate mortality (hunter and non-hunter), to determine the harvest potential for a DAU based on the estimated huntable population (adults) for that DAU, and to set the next season's quota. WS take is included in the CDOW analyses. Based on CDOW analyses, WS is not impacting the population in any DAU. CDOW can reduce the quota in an area where they suspect an over-harvest has occurred or can increase licenses in areas where the population is higher than the desired objective.

Justification for a finding of "no significant impact on the quality of the human environment" with respect to WS's take of mountain lions in Colorado is the fact that WS's involvement has no adverse effect on the *status quo* because, if WS was not available, CDOW or CDA would take, or issue permits to take, virtually the same mountain lions that are killed by WS. Similar to black bear management, WS's involvement should actually *benefit* the ability of CDOW to control mountain lion mortality by encouraging livestock owners to rely on government assistance in resolving depredation problems instead of killing lions themselves. This suggests that, if WS stopped its involvement in mountain lion

management in the State, there would be virtually no change in environmental effects or in cumulative environmental effects other than to potentially increase the number of lions taken by members of the public as allowed under state law.

Bobcat Population Impact Analysis. WS received few requests annually for help with bobcat damage, an average of 5 for FY00 to FY04 (Table 1). In response to these requests, WS took an average of 4 target bobcats annually during that time period (Table 16). WS also took an average of 1 nontarget annually incidental to PDM (Table 6). Hunters harvested an average of 391 annually during the same time (Table 5). The highest WS take and cumulative impact in any year was 6 by WS in FY04 and 525 cumulatively in FY03; this represented an estimated 0.1% take by WS and 5.3% cumulative take. USDA (1997) reported an allowable harvest level for bobcat populations of 20%. Therefore, total harvest could increase fourfold without having an effect on the population. Historic harvest of bobcats (1987-2004) by hunters and trappers reached a high in 1988 of 3,681 (Table 5). This represented 37% of the estimated population of 10,000 (Section 2.2.1.8). This level of harvest may have temporarily reduced the bobcat population, but did not eliminate it. Harvest has remained relatively high except numbers did decrease immediately following the trapping ban in 1996. WS kill has been less than 0.1% of the population and a minor component of overall bobcat mortality. Take by WS could increase substantially as long as private harvest remained the same. It is anticipated that WS bobcat take in Colorado would continue to represent a low percentage of total take, even if PDM activities were increased. Thus, bobcat population impacts of the current program should be minimal and remain at that level in the reasonably foreseeable future.

Badger Population Impact Analysis. WS received an average of 1 request annually for badger damage management (Table 1) and took 1 annually, target (Table 16) and nontarget (Table 6) combined, from FY00 to FY04. Badgers are hunted in Colorado and an average of 244 have been taken in the last 5 years with the highest take occurring in FY02 at 703 (upper confidence interval) (Table 17). Additionally, CDOW issued permits in the last 4 years resulting in an average of 14 taken annually with highest take in FY02 at 52 (Table 18). The highest cumulative take was in FY02 at 755. The estimated population of badgers in Colorado is 52,000 (Section 2.2.1.9). Badger populations can safely sustain an annual harvest rate of 30-40% annually (Boddicker 1980). The cumulative impact in FY02 was 1.4%. The highest harvest prior to the trap ban was in 1988 when an estimated 3,211 badgers were harvested by sportsmen, about 6% of their estimated population. WS concludes that take and cumulative impacts are a minor component of badger and WS does not anticipate that this would increase substantially in the reasonably foreseeable future.

Feral Cat Impact Analysis. Feral cats are common in Colorado, but WS rarely conducts PDM directed at them. WS received an average of 1 request for assistance annually from FY00 to FY04. WS killed a total of 1 feral cat and released 9, most to Animal Control, from FY00 to FY04 in response to requests for assistance. Cats have been cited as having an impact on several wildlife species (American Bird Conservation 1997). The effect of feral cat control would likely be positive, especially for species such as birds. Even if the program were expanded to include control of the cats for wildlife, the take of cats by WS would be minor compared to the number killed by animal control and humane organizations in Colorado each year. The take of feral cats by the program is considered to be of no significant impact on the human environment since cats are not an indigenous component of ecosystems in Colorado.

Opossum Population Impact Analysis. WS received a total of 2 requests for opossum damage management assistance (Table 1). WS killed 1 and released 1 from FY00 to FY04 (Table 16). The hunting season is now closed on opossums and so cumulative impact would consist only of WS and permitted take, or 1. The estimated population of opossums in Colorado is 9,500 (Section 2.2.1.11). A sustainable harvest rate has not been determined, though it is likely high as long as refuges (areas where they are not hunted) for them are maintained (Seidensticker et al. 1999). The cumulative impact from FY00 to FY04 has been negligible. The highest estimated harvest prior to the trap ban was in 1987 at 378 or 4% of the estimated population (Table 5). WS concludes that take by WS in PDM and cumulative impacts are of low magnitude. WS does not anticipate that the level of take would increase substantially, especially to the levels of historic harvest.

Weasel Populations Impact Analysis. WS received a total of 2 requests for assistance with long-tailed weasels and none for short-tailed weasels from FY00 to FY04 (Table 1), but none were taken. The hunting and trapping seasons have been closed on weasels, and, thus, none have been harvested by sportsmen. CDOW did not issue any permits for weasels from

1999-2003, so permitted take was zero. The estimated population of long-tailed and short-tailed weasels is 104,000 and 40,000, respectively (Section 2.2.1.12). A sustainable harvest rate has not been determined for weasels, though it is likely as high as it is for martens (40%). There has been no reported take of weasels by WS or others, and thus no cumulative impact on this species, from FY00 to FY04 The highest estimated harvest prior to the trap ban was 343 long-tailed weasels in 1989 and 113 short-tailed weasels in 1994 (Table 5) representing 0.3% of their estimated populations. WS concludes that WS and cumulative impacts are inconsequential to the weasel population. WS does not anticipate that the level of take would increase substantially, especially to the levels of historic harvest.

Feral Domestic Ferret Impact Analysis. WS did not receive any requests for PDM assistance with feral domestic ferrets and none were taken from FY00 to FY04. WS in several other States have received requests for assistance for feral ferrets from FY99 to FY03, but did not take any, illustrating the potential that WS could receive such a request in Colorado. Any take of feral ferrets by WS would be considered to have no significant impact on the human environment since domestic ferrets are not an indigenous component of ecosystems in Colorado.

Marten Population Impact Analysis. WS did not receive any requests for marten damage management and none were taken from FY00 to FY04. The hunting season is closed on marten and none were taken by sportsmen through CDOW permits. The estimated population of marten is 20,000 (Section 2.2.1.14). A sustainable harvest rate was determined to be 40% for marten (Thompson et al. 1992). The most important factor in maintaining a healthy marten population is having refuge areas (Strickland and Douglas 1999) and large tracts of old-growth forest habitat (Fitzgerald et al. 1994). The marten population has had no impact from WS PDM or sportsmen during the period FY00 to FY04. The highest estimated harvest prior to the trap ban was 3,006 in 1988 representing 15% of the estimated population. WS concludes that WS and cumulative impacts would be inconsequential to the marten population. Take would have to be in the hundreds or thousands before a moderate level impact would occur. The USFS reports that the marten population is apparently stable on the Routt NF which is the NF that has been exposed to the most WS PDM activity of all of the NFs in the State (USFS 1998).

Mink Population Impact Analysis. WS received no requests for mink damage management and none were taken from FY00 to FY04 by WS or by persons with CDOW permits. The hunting season on mink is closed so none were harvested by sportsmen. The estimated population of mink is 80,000 (Section 2.2.1.15). A sustainable harvest rate has not been determined for mink, though it is likely similar to that for badgers (30%), if not higher. The most important factor in maintaining a healthy mink population is having a good food supply. The highest estimated harvest prior to the trap ban was 774 in 1994 representing 1% of the estimated population. WS concludes that WS take and cumulative impacts are inconsequential to the mink population and would have to be in the hundreds or thousands before a moderate level of impact was reached.

Ringtail Population Impact Analysis. WS did not receive any requests for PDM assistance with ringtail and none were taken from FY00 to FY04. The hunting season is closed on ringtail so none were taken by sportsmen or by persons with CDOW permits. The estimated population of ringtail is 12,500 (Section 2.2.1.16). A sustainable harvest rate has not been determined for ringtail, though it is likely similar to that for badgers (30%). The ringtail population has experienced zero impact from PDM or sportsmen during the period FY00 to FY04. The highest estimated harvest prior to the trap ban was 261 in 1987 representing 1.7% of the estimated population. WS concludes that WS and cumulative impacts are inconsequential to the ringtail population and would have to be in the hundreds or thousands before a moderate level of impact was reached.

4.1.1.2 Alternative 2 - No Federal WS PDM. Under this alternative, neither WS nor any other federal agency would provide assistance with PDM and, therefore would not have any effect on target predator populations in Colorado. However, Colorado State agencies (CDA and CDOW), and private entities or organizations conducting PDM could increase their efforts in proportion to the reduction of federal services. CDA's portion of the cooperative program with WS would probably still provide some level of PDM, but without federal supervision. The primary concern with not having a federal program is that impacts on predator populations would increase due to non-professional, private individuals conducting PDM. Many of these individuals would probably be untrained and not licensed to use certain PDM methods that have the potential for significant negative impact when not properly used. These individuals would

not be associated with a federal program. Therefore, accountability, records maintenance, regulatory and policy compliance, and coordination with other agencies would not always be required or adhered to. Thus, the potential for impacting predator populations by non-WS entities would be much higher than under the current program alternative. To illustrate the current level of private efforts, CDOW has administered trapping exemptions to private citizens since 1999 and in 2003 had the highest take (511 target animals among 5 species). It is also likely that without WS to respond to mountain lion and black bear damage complaints, that take would increase under this alternative. These efforts, and efforts by agencies and organizations, to reduce or prevent depredations would probably produce results similar to those of the proposed action (depending on the level of effort expended by the State and private persons and organizations). For the reasons discussed in the population impacts analysis, section 4.1.1.1, it is highly unlikely that predator populations would be affected by implementation of this alternative. However, the potential for use of illegal chemical toxicants caused by frustration as described in 4.1.2 could lead to unknown, but potentially high impacts, on carnivore populations. Additionally, if no agency, groups, or individuals were able to respond to damage complaints, much of the public could become intolerant of wildlife as a whole (International Association of Fish and Wildlife Agencies 2004).

- **4.1.1.3 Alternative 3 Technical Assistance Only.** Under this alternative, WS would only provide advice or guidance on PDM techniques and methods. WS would not conduct any direct operational PDM in attempting to resolve damage complaints, and therefore, would not have any impact on predators in Colorado. As discussed under the No Federal Program Alternative, similar PDM would likely be conducted by private individuals, State agencies and organizations in proportion to federal services lost. It is unlikely, though, that impacts on target predator species populations would be detected because predator populations in Colorado are considered to be relatively stable. Similar negative impacts as discussed under Alternative 2 would likely occur (improper use of PDM methods, higher take of the larger predators, illegal use of chemicals, and public intolerance towards wildlife).
- 4.1.1.4 Alternative 4 Nonlethal Required before Lethal Control. This alternative would require that resource owners or WS Specialists use nonlethal techniques prior to WS implementing lethal PDM methods to resolve a damage problem. For many damage situations, this would be no different than the proposed action because many resource owners have already been attempting to use nonlethal PDM methods. However, where nonlethal methods have not been attempted, this alternative would reduce WS's ability to quickly address some predator damage problems. Based on experience, a WS Specialist may already be able to predict whether the use of nonlethal PDM methods will successfully resolve a particular depredation problem. WS policy already specifies that WS Specialists use nonlethal methods first, as appropriate. For example, using the WS Decision Model (Slate et al. 1992), a WS Specialist may determine that lethal PDM methods are necessary to abate a current problem. But they would also provide the landowner information on nonlethal techniques to reduce the likelihood of recurring damage. Since nonlethal PDM methods do not always prevent or reduce predator damage to acceptable levels, State or local agencies, and private organizations or individuals would likely assume responsibility for implementing the lethal PDM methods necessary to adequately deal with these problems. WS would have a lesser impact on target predator species populations under this alternative, but others would likely initiate lethal control prior to WS and take more predators than under Alternative 1, resulting in similar take. In fact, as discussed under Alternative 1, more black bears and mountain lions might be taken because private individuals would not be as apt to successfully harvest the target predator and might take several animals before actually harvesting the target individual. In addition, a private citizen may be less effective than a WS Specialist at resolving a damage problem, and allow more damage to occur while attempting to take the target animal. Under this alternative, agricultural and property resource losses are expected to be greater than under the current program alternative due to restrictions placed on WS personnel. For the reasons discussed in the population impacts analysis in section 4.1.1.1, it is highly unlikely that coyote or other predator populations would be impacted under this alternative. Impacts and possible risks of PDM method misuse and illegal chemical toxicant use under this alternative would probably fall somewhere between Alternative 1 and 2.
- 4.1.1.5 Alternative 5 Corrective Control Only When Lethal PDM Methods are Used. Under this alternative, WS take of target predator species would probably be somewhat less than that of the proposed action because lethal actions by WS would be restricted to situations where damage had already occurred. Preventive control is used most often in cattle and sheep production areas that have had historical damage, primarily from coyotes. Most sheep and cattle producers already use one or more nonlethal PDM methods. Connolly and Wagner (1998) found that 55% of the United

States sheep producers, that own 70% of the nations' sheep, used one or more nonlethal PDM measures in 1994. Fencing, husbandry, guard animals, and frightening tactics were the most common nonlethal PDM methods used. Even with preventive nonlethal methods in use, it has been found that preventive aerial hunting reduced sheep and lamb losses later in the year compared to sites without (Gantz 1990, Wagner and Conover 1999). Decreased effectiveness is related to the logistics of getting to these areas and having to use less effective coyote removal methods during the summer months. The coyotes most likely to kill sheep are the ones raising pups (Till and Knowlton 1983) and that late winter aerial hunting of coyotes on summer sheep grazing allotments removes coyotes that otherwise would likely have produced pups (Gantz 1990). By conducting preventive PDM in late winter, the likelihood of transient coyotes reoccupying vacated territories and establishing new territories in time to produce pups is greatly reduced. Gantz (1990) concluded that late winter aerial hunting of coyotes on summer sheep range was an effective method to reduce coyote predation. Additionally, by restricting corrective PDM to the immediate vicinity of predation losses, WS would be

unable to effectively resolve some depredation problems. Till (1992), found that depredating coyotes traveled an average of 2 miles and as far as 6 miles from their den site to the sheep flocks where they were killing lambs.

Where damage had not occurred, the requestor or WS could use only nonlethal PDM methods. For many individual damage situations, this alternative would be similar to the current program because many producers do not contact WS until damage has already occurred. In addition, WS does not conduct proactive PDM for many of the predator species in this EA because of the relatively low occurrence and unpredictability of damage. WS conducts preventive PDM for species such as coyotes and red fox where a resource owner has had historic damage. Without WS conducting proactive PDM activities, it is likely that private efforts at proactive control would increase. These increased private PDM activities would lead to potentially similar cumulative impacts as those described under Alternative 4. Predators taken by WS would likely be fewer than described in Alternative 1, but private efforts would likely increase resulting in similar levels of take. For the reasons discussed in the population impacts analysis in section 4.1.1.1, it is highly likely that coyote or other predator populations would be significantly impacted by

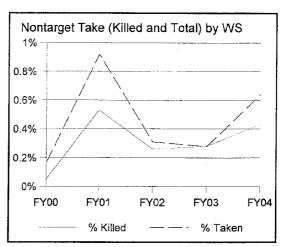


Figure 7. The percentage of nontarget species killed and taken (killed and freed) compared to the respective totals of all animals taken in PDM by WS in Colorado from FY00 to FY04. Nontarget take has remained below 1% of the total.

implementation of this alternative. Impacts and hypothetical risks from the misuse of PDM methods or illegal chemical toxicant use under this alternative would probably fall somewhere between Alternatives 1 and 2.

4.1.2 Effects on Nontarget Species Populations, Including T&E Species

Nontarget species can be impacted by PDM whether implemented by WS, other agencies, or the public. Impacts can range from direct take while implementing PDM methods to indirect impacts resulting from the reduction of predators in a given area. Measures are often incorporated into PDM to reduce impacts to nontarget species. Various factors may, at times, preclude use of certain methods, so it is important to maintain the widest possible selection of PDM tools for resolving predator damage problems. However, the PDM methods used to resolve predator damage must be legal and biologically sound. Often, but not always, impacts to nontarget species can be minimized. Where impacts occur, they are mostly of low magnitude in terms of nontarget species populations. Following is a discussion of the various impacts under the Alternatives.

4.1.2.1 Alternative 1 - Continue the Current Federal PDM Program. Colorado WS took some nontarget species while conducting PDM. That take was less than 1% of the total take of all animals killed by WS conducting PDM over the last 5 FYs (Figure 7). As PDM methods have improved in the last few decades, the incidence of nontarget take has decreased. Nontarget species taken from FY00 to FY04 (Table 4) included 11 species (10 predators analyzed in this

EA in Section 4.1.1.1 and 1 other species). Nine of the species had only one taken lethally in the last 5 FYs. This gives a good indication of the selectiveness of the PDM methods used. Measures to minimize nontarget impacts were described in section 3.4.2.2. These SOPs have insured that nontarget take in Colorado remains relatively low. Nontarget species taken in Colorado were recorded as unintentional targets and nontargets. Unintentional targets are listed on the agreement as a target species, but are taken unintentionally during efforts to take other target species. Nontargets are not listed as target species on the agreement and are taken unintentionally during efforts to take target species. The only difference under this EA from the past Current Program Alternatives in the previous EAs (WS 1997b, 1999a) is that WS Specialists would have a more consistent selection of PDM techniques to use. Policies for their use would be more consistent across the state and not determined by artificial boundaries (east vs west). Although, for the most part they were the same in the two previous EAs.

Unintentional target and nontarget animals killed by WS during PDM activities from FY00 to FY04 averaged 3 raccoons, 3 striped skunks, 1 swift fox, 0.8 red fox, 0.6 badger, 0.6 bobcat, 0.4 feral dogs, 0.4 gray fox, and 0.2 porcupines per year. No more than one or a few of these species were taken and impacts to these species would be considered light. Nontarget take was included in the population impacts analysis under 4.1.1.1 for predator species killed as nontargets (excluding porcupine). Cumulative impacts to these populations, including the take of nontargets, was minimal. In fact, evidence exists that small carnivore abundance typically increases in areas where coyote populations have been reduced (Robinson 1961, Nunley 1977). Thus, current PDM activities in Colorado may benefit the smaller predators. No analysis for porcupine population impacts is presented here because this species is common in Colorado and nontarget take by WS PDM is low enough to be minor at the population level. Other potential nontarget species that could be taken are considered abundant enough, with the exception of the T&E species discussed below, that PDM would have, at most, a minor impact at the population level. Colorado WS does not anticipate any substantial increase in nontarget take under the proposed action.

Consideration of Impacts to T&E Species in Colorado. Measures to avoid T&E impacts were described in section 3.4.2.2. Those measures should ensure that the proposed action will minimize PDM impacts on T&E species. Of the Federal and State listed species occurring in Colorado, it was determined that PDM could adversely affect only terrestrial vertebrate species (mammals and birds). Because PDM methods will not affect water or wetlands, Colorado's T&E fish and amphibian species were not considered. Colorado have any reptilian species listed, and thus were not considered. Since WS PDM will not modify or impact habitat to any extent, T&E plants and butterflies were also not considered. Table 7 in Chapter 2 identified the species that could potentially be impacted by PDM; 11 species could be negatively affected by PDM activities whereas 10 T&E species could benefit.

T&E Species with the Potential for Adverse Impacts from PDM

USFWS and CDOW monitor several species considered threatened, endangered, or sensitive in Colorado. These agencies monitor these species' populations to determine if different activities singly or combined are impacting the populations (a cumulative impact analysis). Mortality for T&E species is monitored where feasible. But mortalities due to road kills, loss of habitat (i.e., land development, construction, housing, industrial complexes, road, mining, and oil and gas development), and natural disasters (i.e., fires, floods, lightning, heavy winters, and drought) are the same under all alternatives (environmental status quo) and much of this activity that results in mortality or population limiting factors is difficult to determine. These factors are not likely to be determined sufficiently even with unlimited funding thus, can only be estimated based on how well a population is doing (increasing, decreasing, stable). The availability of habitat is often the most critical concern because the available habitat determines the number an area can support. WS consults with these agencies, as necessary, to provide them with information regarding WS's potential to take these species with PDM methods. WS has determined that one or more PDM activities have the potential to adversely affect 11 T&E species (not including 2 species considered extirpated). However, these methods are not likely to place the species in jeopardy following reasonable and prudent alternatives or measures initiated to minimize impacts. Most of these species have already been discussed in the BO issued by USFWS in 1992 (USDA 1997). Details can be found in that document for most of the following may affect species. In the formal consultation, reasonable and prudent alternatives or measures were addressed along with an incidental take statement, where

appropriate, with species-specific terms and conditions. WS abides by these and has not impacted any federally listed T&E species in Colorado while conducting PDM since the BO was written.

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The USFWS 1992 BO (USDA 1997) on the national WS program listed the black-footed ferret, grizzly bear, gray wolf, bald eagle, Attwater's greater prairie chicken (listed because of grouse species in Colorado), and California condor as likely to be adversely affected by some aspect of the WS PDM program (USDA 1997). An analysis of the potential effects on these species may be found in Appendix F of USDA (1997). WS is currently undergoing a new nationwide consultation with USFWS because several species have been added and others delisted since that consultation. Regarding the Canada lynx, WS abides by the BO obtained from USFWS (2005), which found WS actions would not jeopardize the lynx and contains authorization for incidental take and reasonable and prudent measures and terms and conditions for minimizing take. Of the species historically listed in Colorado, it is believed that grizzly bears and wolverines have been extirpated from the State. WS would coordinate closely with the managing agency, USFWS or CDOW, should either species or their sign (i.e., tracks or scat) be found. WS would abide by the Reasonable and Prudent Alternatives and Measures, and Terms and Conditions to avoid take for grizzly bears within the areas where discovered. Additionally, the 1992 USFWS BO (USDA 1997) listed the whooping crane as likely to be adversely affected, but not by WS PDM. The Eskimo curlew, least tern and piping plover were listed as not likely to be adversely affected, but benefit from WS PDM. Following is information regarding the species that could be adversely affected.

Black-footed Ferret. The black-footed ferret was recently reintroduced into western Colorado and a reestablished population now exists at the reintroduction site. It is doubtful, though remotely plausible, that a wild population exists in Colorado today. The 1992 USFWS BO (USDA 1997) stated that leghold traps and gas cartridges used in PDM had the potential for taking ferrets (the label for the M-44 does not allow its use in prairie dog towns to preclude exposure to ferrets and thus has no effect on the ferret). However, WS uses pan-tension devices which preclude capture of the ferrets when working in or near prairie dog colonies. Gas cartridges are only used as allowed under the Reasonable and Prudent Alternatives of the USFWS BO (USDA 1997). WS has not taken any black-footed ferrets in Colorado. WS has worked with USFWS to reduce predation of ferrets. It has been found that PDM prior to the establishment of a new ferret colony is essential for their survival. In one of the first releases, 34 of the 39 ferrets released were killed by predators. It was found that controlling predators in the area prior to the release helped get their population established in subsequent releases. The current population in Colorado has been successful and continues to grow. WS has not cumulatively added to any known take.

Kit fox. Kit fox in Colorado are on the eastern part of their range in the U.S. Several tools used in PDM have the potential for taking a kit fox; but CDOW has regulations that, when implemented, minimize the potential for WS Specialists to take one. WS avoids using lethal tools where they are known to exist. WS also uses pantension devices on leg-hold traps and stops on snares to exclude them from take. None were taken in the last 5 FYs. During the period from 1987 to 1994, an average of 13 were harvested annually. In 1995, the season on kit fox was closed. These harvest figures illustrate that the population can sustain some low level of harvest without detriment to the population (Table 5). Limited distribution in Colorado, habitat loss, and predation likely contribute to their low density their rarity. Colorado's kit fox population is abundant within the available habitat and stable where found. WS has not cumulatively added to any known recent take.

Canada Lynx. PDM methods that have the greatest probability of incidental take include leghold traps and snares, and, to a lesser extent, M-44s and trailing dogs. WS abides by the August 23, 2005 BO from the USFWS which authorizes incidental take and established reasonable and prudent measures and terms and conditions to minimize the risk of take (described in Section 3.4.2.2). WS has not taken a lynx in Colorado with the exception of one in response to a request from CDOW officials to live-capture and relocate a lynx that had left lynx habitat and was found in a desert wash west of Grand Junction. The lynx was captured by WS (acting as an agent for CDOW) under CDOW's USFWS permit. Trailing dogs treed the lynx where it was immobilized, rehabilitated and transported by CDOW personnel back to lynx habitat (it had become emaciated).

Currently, the lynx population in Colorado has been increasing as a result of additional reintroductions from Canada and Alaska, as well as through natural reproduction. Mortalities can be attributed to lynx being shot, killed on highways, and other factors, and are closely monitored by CDOW and USFWS. Thus far, WS has not added to any cumulative mortality and, based on the experience of the WS program over many years, we believe WS PDM is not likely to result in take that would adversely affect lynx recovery in the State.

Some commentors have expressed a concern that WS PDM activity might contribute in some substantive way to what might be significant cumulative impacts on lynx because of other actions unrelated or unconnected to WS PDM examples of which include oil and gas development, timber harvesting, residential subdivision development, and grazing. USFS is currently in the process of revising land use plans to address lynx conservation needs and we refer the reader to those documents (available at http://www.fs.fed.us/r2/projects/lynx/).

USFWS evaluated and considered future cumulative effects in a BO (USFWS 2005) of other types of activities such as residential and commercial development, recreational activities such as snowshoeing and snowmobiling, agricultural development, and livestock grazing, and concluded that the potential effects of WS PDM actions in the State when combined with these other activities would not pose jeopardy to the continued existence of lynx. Therefore, we find no evidence presented from the USFWS that WS PDM poses any significant threat to lynx conservation in the State.

The USFWS has previously determined that timber harvesting could be a threat to lynx, but could also be beneficial depending on harvest methods, spatial and temporal specifications, and the inherent vegetation potential of the site. Forest practices in lynx habitat that result in or retain a dense understory provide good snowshoe hare habitat that in turn provides good foraging habitat for lynx (FR 68 40076 - 40101, July 3, 2003). Regarding effects of other types of activities, the USFWS determined that roads and trails, agricultural and urban development, off-road-vehicle and snowmobile use, ski resort expansion, mining, fire suppression, and grazing could also adversely affect lynx. However, USFWS found that the threat to lynx by some of these activities, such as fire suppression, is low, and also found no evidence that some activities, such as forest roads, pose a threat to lynx. Some of the activities suggested, such as mining and grazing, were not specifically addressed because they had no information to indicate they pose threats to lynx.

Most suitable lynx habitat in the State is on USFS lands, with lesser amounts occurring on lands under BLM management (FR 68 40076 - 40101, July 3, 2003). It is apparent that the USFS and BLM are committed to habitat and land management actions that will serve to benefit lynx, since they have signed an agreement with the USFWS (reference in FR 68 40076 - 40101, July 3, 2003) to operate in accordance with the Lynx Conservation Assessment and Strategy (Ruediger et al. 2000). Therefore, we find no reason to believe lynx recovery efforts in Colorado will be adversely affected by the many activities identified above that might occur in suitable lynx habitat areas. WS has no decision-making authority over land management actions. Therefore, those actions and their effects are part of the existing human environment or "status quo" whether or not WS conducts any PDM activities.

WS PDM actions do not alter or otherwise affect habitat. Such actions also have no potential to adversely affect the primary prey species of the lynx which is the snowshoe hare. No snowshoe hares have been taken as nontarget animals by PDM activities in the State as shown by the information in Section 2.2.2.1. Currently, the only PDM methods used by WS on USFS and BLM lands involve shooting (aerial or ground based), which are virtually 100% selective for target species. Thus they pose no risk of taking a lynx in the areas where lynx are most likely to occur, which further lessens the chance of any contribution to adverse cumulative effects by WS PDM. Any coyote removal from lynx habitat that occurs because of PDM may actually benefit lynx (see additional discussion about T&E species that might benefit from WS PDM here in Chapter 4). Because WS PDM activities have not contributed to any lynx mortality, and because the potential for those activities to contribute to future lynx nontarget mortality, although perhaps real, is low based on WS's history of experience in Colorado and other States, we find no reason to conclude that WS PDM in the State is likely to contribute

to any significant cumulative adverse effects on lynx.

River Otter. Otters can be avoided by not trapping along lake shores, streams, and rivers, especially where sign is found. Where otters have the potential to be taken, padded-jaw leghold traps are used. CDOW has measures to reduce the potential for take. These are adhered to by WS personnel and are listed in Section 3.4.2.2. Colorado WS has not taken an otter while conducting PDM from FY00 to FY04. CDOW recently downlisted the otter from endangered to threatened as a result of successfully establishing a viable population in the State.

Gray Wolf. Gray wolves were extirpated from in Colorado by the mid-1930s. Currently the only wolf documented in Colorado was a transient from Wyoming that came into Colorado, but was found dead on I-70 near Idaho Springs. Several tools used in PDM such as leghold traps, snares, M-44s, and aerial hunting for large predators such as coyotes and mountain lions have the potential to take a wolf. SOPs that would be used by WS to minimize risks to the gray wolf include all SOPs and other measures to reduce the likelihood of take listed in Section 3.4.2.2. No gray wolves have been taken by WS since the 1930s and none are expected to be in areas where WS is conducting PDM. Gray wolf populations have been increasing and doing well in their experimental areas. WS has not cumulatively added to any known take. WS will be notified of verified wolf sightings by USFWS or CDOW. In turn, WS will notify USFWS and CDOW if a WS Specialist documents the presence of a gray wolf in Colorado.

California Condor. Some concern has arisen regarding the potential of PDM to affect condors that venture out of their experimental range in Arizona and enter Colorado. WDM tools that may affect California condors include the M-44, snares, leghold traps, and lead pellets/bullets ingested from carcasses of predators taken by shooting. Measures to reduce likely impacts to the condor are given in Section 3.4.2.2. WS has not taken a condor nor does WS anticipate such an occurrence, and will abide by the 1992 USFWS BO (USDA 1997) and relevant measures to minimize any potential take anywhere condors come into Colorado. The experimental population of condors has been increasing slowly through introductions and successful wild reproduction. However, condors reproduce slowly and it may take some time to fully establish their population. As their numbers increase, more condors may be seen in Colorado, but this is hard to predict. WS has not cumulatively added to any known take.

Bald Eagle. The risk of lead poisoning, caused by eagles ingesting lead in predator carcasses killed by shooting, was discussed with the USFWS. In Colorado, WS uses nontoxic and copper plated lead shot in all aerial hunting operations to minimize any likelihood of poisoning bald eagles. Carcasses of predators killed with high-powered rifles normally do not retain the lead bullet. For PDM methods that could adversely affect bald eagles, such as leghold traps, the traps are placed at least 30 feet from carcasses or "draw stations." Based on an evaluation and discussion with the USFWS and CDOW, WS has concluded that implementation of the proposed action would not likely affect the bald eagle. To date, WS in Colorado has not taken a bald eagle, but acknowledges that the potential exists. Therefore, WS will minimize these risks by abiding by the SOPs and measures to reduce the potential for take given in Section 3.4.2.2. Bald eagle populations are increasing across their range indicating that the population is recovering and that mortality from all causes has not exceeded a significant level. WS has not cumulatively added to any known take.

Plains Sharp-tailed Grouse, Lesser Prairie-chicken, and Gunnison's Sage-grouse. Plains sharp-tailed grouse is on Colorado's endangered species list. They are found in open habitat in the eastern portion of Colorado. The lesser prairie-chicken and Gunnison's sage-grouse are candidates for Federal listing. Lesser prairie-chickens are found in short grass prairies of southeastern Colorado and the Gunnison's sage-grouse in sagebrush habitat of southwestern Colorado. Decline in these species has been linked primarily to habitat loss, although other factors may play a role (Arritt 1997). PDM activities are conducted in the areas these gallinaceous birds inhabit. None of these species are federally listed as T&E so have not been covered in a BO. However, USFWS did discuss the Attwater's prairie-chicken, which is a comparable species in relation to PDM, in the 1992 BO (USDA 1997). The BO found that only the leghold trap used in PDM posed jeopardy to the

prairie-chicken. But under the Reasonable and Prudent Alternatives that were established, requiring the use of pan-tension devices where Attwater's prairie chickens were present, the potential for take was negated (USDA 1997, USFWS 1998b). WS in Colorado already follows this policy statewide unless smaller predators (i.e., skunk) are targeted. However, WS would not use leghold traps without pan-tension devices where plains sharp-tailed grouse, lesser prairie-chickens, or Gunnison's sage-grouse are found. WS can rely on cage traps or other methods to capture small predators. WS has not cumulatively added to any known take, and likely has benefitted many subpopulations of these species by conducting PDM in their range. In section 2.3.2, we further discuss issues regarding potential indirect effects on sage grouse because of PDM.

T&E Species that Could Potentially Benefit from PDM

PDM methods used by WS while targeting predators may have the potential to benefit several Federal and State listed T&E species. These species include the black-footed ferret, kit fox, Canada lynx, California condor, piping plover, least tern, burrowing owl, plains sharp-tailed grouse, lesser prairie-chicken, and Gunnison's sage-grouse. For example, WS conducted PDM prior to the release of black-footed ferrets in western Colorado. WS targeted coyotes and bobcats and the release appears to have been a success. PDM is considered an essential component of release protocol for black-footed ferrets because almost all ferret mortality in the first release (34/39) was predator related. WS has participated in rangewide efforts to continue some PDM following ferret releases to ensure that a viable population is established.

Buskirk et al. (1999) described the two major competition impacts on lynx as exploitation (competition for food) and interference (avoidance). Of several predators examined, coyotes were deemed the species most likely to pose local or regionally significant exploitation impacts to lynx. Additionally, coyotes and bobcats were deemed to have the potential for important interference competition effects on lynx. Coyotes have greatly expanded their winter range in some areas throughout the United States, including Colorado, because they can now use snow-packed trails and plowed roads to gain access into lynx winter habitat areas. Previously, deep snows hindered their ability to move into and occupy such areas (USDA 2004). The benefits of removing coyotes from Canada lynx habitat may outweigh any potential for negative impacts on the lynx by reducing direct competition for prey, predation of lynx kittens, and avoidance of certain areas by lynx due to the presence of coyotes.

WS is currently conducting PDM nationally to protect several gallinaceous species including the Attwater's prairie-chickens from predators (USFWS 1998b). In certain areas, lesser prairie-chicken, sharp-tailed grouse, and sage-grouse numbers have declined to precariously low levels. Predators have been found to have at least some impact on grouse populations in their range so PDM could have a positive effect on grouse populations by keeping their numbers at higher levels. When WS conducts PDM in grouse habitat, WS avoids working within a quarter mile of known leks. Leks are traditional strutting grounds where birds congregate during early morning hours to breed. USFWS (1998b) conducted an informal intraservice consultation and found that PDM for the protection of Attwater's prairie chicken would have a beneficial impact and no adverse affects. Several of these T&E species projects have been ongoing for several years, a testimony to their success.

The new Western Association of Fish and Wildlife Agencies sage-grouse management guidelines suggest that PDM for protection of sage-grouse should be implemented only if nest success is less than 25% or survival of adult hens is less than 45%. Although the Western Association of Fish and Wildlife Agencies sage-grouse management guidelines (Connelly et al. 2000) address the issue of nesting success and adult hen survival in relation to the need for PDM, they do not address the appropriateness of PDM in areas with low chick survival. There has been very little information available on this subject until recently. Results of studies conducted in 1999 and 2000 in Idaho suggested that survival rates for sage-grouse chicks were only 15% and 18%, respectively, and that predators were responsible for 90-100% of the mortality (Burkepile et al. 2001). Although most sage-grouse management plans suggest indirect management of grouse-predator relationships through habitat manipulation, Schroeder and Baydack (2001) have suggested that managers should consider PDM as a management option and evaluate its viability through experimentation.

4.1.2.2 Alternative 2 - No Federal WS PDM. Under this alternative, neither WS nor any other federal agency would provide assistance with PDM and, therefore, would not have an effect on nontarget or T&E species, or impact wildlife populations with low-level flying. USDA (1997) demonstrated that under the no federal program alternative, more nontarget animals would be affected. CDOW and CDA would probably still provide some level of professional PDM assistance, but without federal supervision, and would continue to take minimal numbers of nontargets, proportionate to the decrease in state and federal efforts. Private efforts to reduce or prevent depredations would increase the most under this alternative. This would result in less experienced persons implementing PDM methods leading to a greater take of nontarget wildlife (potentially including T&E species) than under the current program or any of the other Alternatives. Similar to WS PDM, private individuals could take coyotes and other predators year-round. Private landowners would increase the number of trapping exemptions claimed requiring more time and effort by CDOW personnel. Even though, resource owners would need to notify CDOW of their trapping exemptions, private individuals would not be restricted to WS SOPs such as WS's self-imposed restrictions (i.e., not setting traps closer than 30 feet to livestock carcasses to avoid capturing scavenging birds or using pan-tension devices to exclude smaller animals). Therefore, hazards to raptors, including bald eagles, and other nontargets could be greater under this alternative. As described in 2.3.3, the hypothetical use of chemical toxicants could impact nontarget species populations, including T&E species. It is, therefore, likely that more impacts to nontarget species would occur under this alternative than the current program.

- 4.1.2.3 Alternative 3 Technical Assistance Only. Alternative 3 would not allow WS to conduct direct operational PDM. Therefore, WS would not have any direct impact on nontarget or T&E species. Under this alternative, CDA and CDOW would likely provide some level of professional assistance with PDM. However, private PDM efforts would likely increase in proportion to any reduced effort in PDM by WS. Although technical support from WS might lead to more selective use of PDM methods by private parties than that which could occur under Alternative 2, private efforts to reduce or prevent depredations could result in less experienced persons implementing PDM methods leading to greater take of nontarget wildlife and T&E species as discussed under Alternative 2. This alternative would have the potential for increased adverse impacts resulting from WS not providing quality PDM and the compensatory actions of private individuals. Presumably, many service recipients would become frustrated with WS's failure to resolve their wildlife damage, and would go elsewhere for assistance. Higher variability in the level and scope of PDM activities could occur without a full IWDM program, and this could have a greater negative effect on some local wildlife species (including T&E species).
- 4.1.2.4 Alternative 4 Nonlethal Required before Lethal Control. This alternative would require that resource owners or WS Specialists use nonlethal techniques prior to WS implementing lethal PDM methods to resolve a damage problem. For many damage situations, this would be no different than the proposed action because many resource owners would have already attempted the use of nonlethal PDM methods prior to contacting WS for assistance. However, where nonlethal methods have not been attempted, this alternative would reduce WS's ability to quickly address certain predator damage problems. Based on experience, a WS Specialist may already be able to predict whether the use of nonlethal PDM methods will successfully resolve a particular depredation problem. WS policy already requires the use of nonlethal methods first, if appropriate. Using the WS Decision Model (Slate et al. 1992), a WS Specialist may determine that lethal PDM methods are necessary to abate a current problem. But the WS Specialist would also provide the landowner information on nonlethal techniques to reduce the likelihood of recurring damage. Since nonlethal PDM methods do not always prevent or reduce predator damage to acceptable levels, State or local agencies, private organizations, and individuals would likely assume responsibility for implementing the lethal PDM methods necessary to adequately deal with these problems. WS would have a lesser impact on nontarget and T&E species populations under this alternative compared to Alternative 1, but the potential exists for private citizens to initiate lethal control prior to WS involvement. If this occurs, the nontarget take would likely increase (potentially including T&E species) to a level greater than under Alternative 1. Measures to avoid T&E impacts were described in Chapter 3. Whereas WS would adhere to these measures, private citizens might or might not be required to act in accordance with them. This could lead to greater impact on T&E species under Alternative 4.
- 4.1.2.5 Alternative 5 Corrective Control Only When Lethal PDM Methods are Used. Alternative 5 would not allow WS to conduct preventive operational PDM. For many individual damage situations, this alternative would be

similar to the current program because producers often do not contact WS until damage has already occurred. WS conducts proactive control for a few predators because most predators cause only sporadic damage. WS conducts preventive control primarily for coyotes where the area has had historic damage and the population level is such that damage is expected to reoccur. Preventive damage management for coyotes is often conducted with aerial hunting. Wagner and Conover (1999) concluded that the need of traps, snares, and M-44's for corrective control was lower at sites with preventive aerial hunting than sites without preventive aerial hunting. Leghold traps, snares, and M-44s have a higher risk of capturing a nontarget species than aerial hunting. Therefore, WS is likely to have more impacts from these methods to nontargets, than under the Proposed Action Alternative. Therefore, risks to nontarget species by WS PDM activities would probably be slightly greater under this alternative.

This alternative would also have the potential for increased adverse impacts resulting from private individuals. Presumably, WS PDM recipients that are anticipating damage in historic loss areas and become frustrated with WS's failure to prevent predator damage from occurring, would turn elsewhere for assistance. These increased private PDM activities could lead to potentially similar impacts as those described under the No Program Alternative. However, technical support on damage prevention might lead to more selective use of PDM methods by private parties than that which are likely to occur under Alternative 2. Impacts and potential risks from illegal chemical toxicant use under this alternative would probably be the same as those under Alternatives 2 and 3. Therefore, it is concluded that more nontargets, potentially T&E species, could be taken under this alternative than under Alternative 1, the Current Program, but less than Alternative 2.

4.1.3 Impacts on Public Safety, Pets, and the Environment.

4.1.3.1 Alternative 1 - Continue the Current Federal PDM Program. The use of PDM methods by WS poses little potential hazards to WS employees themselves or to the public because all methods and materials are consistently used in a manner known to be safe. A detailed risk assessment analyzed all PDM methods used by WS in relation to their potential to impact public safety and found low level risks associated with only a few (USDA 1997, Appendix P). This assessment included potential risks to WS employees, the public, nontarget animals including pets, and the environment. While some of the materials and methods used by WS have the potential to represent a threat to health and safety if used improperly, problems associated with their mis-use have rarely occurred. This favorable record is due to training and certification programs for the use of PDM methods such as the M-44 (CDA tests applicators) and compliance with chemical use, firearms (mandatory firearms training every 2 years - WS Directive 2.615), and aviation safety (pilot and gunner training). The proper use of PDM methods and safety is stressed through training and policies. The risk to the public is further reduced because most WS PDM methods are used mostly in areas where public access is limited. Additionally, warning signs are prominently posted to alert the public when and where, in the general area, toxic devices or traps are deployed. WS coordinates with cooperators or landowners about where and when PDM methods are to be used, thereby decreasing the likelihood of conflicts with the public. The issue of safety was discussed in 2.3.3 and SOPs were addressed in section 3.4.2.3.

Impacts on public safety and environment would be no different than the current program since the WS SOPs to protect the public and environment would be the same as under the current program analyzed in the two EAs (WS 1997b, 1999a). Under this alternative, WS have a uniform statewide policy which would allow WS to use PDM methods in areas where they may not have been used before. Even so, WS would have minimal, if any, effects on public safety and the same positive effects as far as protecting the public from predators.

WS PDM activities are also not likely to negatively effect the public in terms of "Environmental Justice" and "Executive Order 12898" (see section 1.5.2). "Environmental Justice" and "Executive Order 12898" relate to the fair treatment of people of all races, income and culture with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is a priority within USDA, APHIS, and WS. Also, all APHIS-WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to ensure Environmental Justice.

Under the current program alternative, PDM methods could be used to resolve complaints involving predators that

represent a risk to public health and safety. Recent projects involving predators that represented a human health and safety risk, such as those described in 2.3.3, were effectively resolved using PDM methods such as traps and firearms.

Potential Effects from Aerial Hunting on Public Safety and the Environment. The following discussion relates to concerns about the potential for aircraft accidents (associated with WS's aerial hunting operations) to cause catastrophic ground fires and pollution as a result of spilled fuel and oil. Information was obtained from Mr. Norm Wiemeyer, Chief, Denver Field Office of the National Transportation Safety Board (the agency that investigates aviation accidents).

Major Ground or Forest Fires. Mr. Wiemeyer stated he had no recollection of any major fires caused by any government aircraft; he has been in his position since 1987. In addition, there are no reports of fires caused by WS aircraft in other states. The period of greatest fire danger typically occurs during the summer months, but WS ordinarily conducts few, if any, aerial hunting operations during the summer months.

Fuel Spills and Environmental Hazard from Aviation Accidents. The National Transportation Safety Board stated that aviation fuel is extremely volatile and will evaporate within a few hours or less to the point that even its odor cannot be detected (N. Wiemeyer, National Transportation Safety Board, pers. comm., 2000). Jet A fuel does not pose a large environmental problem if spilled. It is a straight chained hydrocarbon with little benzene present and microbes would quickly break-down any spill residue through aerobic action (J. Kuhn, Montana Department of Environmental Quality, pers. comm., 2001). The quantities used by WS aircraft are relatively small (52 gallon maximum in a fixed-wing aircraft and 91 gallon maximum in the helicopters used by WS), and during much of each flight the amount of fuel on board would be considerably less than these maximum amounts. In some cases, not all of the fuel would be spilled. Thus, there should be little environmental hazard from unignited fuel spills.

Oil and Other Fluid Spills. For privately owned aircraft, the aircraft owner or his/her insurance company is responsible for clean-up of spilled oils and other fluids, but only if required by the owner or manager of the property on which the accident occurred. In the case of BLM, USFS, and National Park Service lands, the land managing agency generally requires soil to be decontaminated or removed and properly disposed of. With the size aircraft used by WS, the quantities of oil capable of being spilled in any accident are small (i.e., 6-8 quarts maximum for reciprocating (piston) engines and 3-5 quarts for turbine engines) with minimal chance of causing environmental damage. Aircraft used by WS are single engine models, so the greatest amount of oil that could be spilled in one accident would be about 8 quarts.

Petroleum Biodegradation. Petroleum products degrade through volatilization and bacterial action, particularly when exposed to oxygen (EPA 2000). Thus, small quantity oil spills on surface soils can be expected to biodegrade readily. Even in subsurface contamination situations involving underground storage facilities, which would generally be expected to involve larger quantities than would ever be involved in a small aircraft accident, EPA guidelines provide for "natural attenuation" or volatilization and biodegradation to mitigate environmental hazards (EPA 2000). Thus, even where oil spills in small aircraft accidents are not cleaned up, the oil does not persist in the environment or persists in such small quantities that there is no problem. Also, WS's accidents generally would occur in remote areas away from human habitation and drinking water supplies. Thus, the risk to drinking water appears to be exceedingly low or nonexistent.

Human Safety Consequences of Aerial Hunting Accidents. Beyond environmental consequences, other issues related to aviation accidents include the loss of aircraft and risks to the public and crew members. WS's use of aircraft is quite different from general aviation (GAV) use. The environment in which WS conducts aerial hunting is inherently a higher risk environment than that for GAV. Low-level flights introduce hazards such as power lines and trees, and the safety margin for error during maneuvers is diminished compared to high-level flights. In 1998, WS commissioned an independent review of its aerial hunting operations as a result of several accidents. The panel made several recommendations to WS regarding enhanced aerial safety. WS implemented most all of these recommendations by 2001. WS has implemented an Aviation Safety Program to support aerial activities and recognizes that an aggressive overall safety and training program is the best way

to prevent accidents. While the goal of the aviation program is to have no accidents (L. Burraston, WS 2005 pers. comm.), accidents may still occur, especially those involving mechanical failure. WS agency pilots and contractors are highly skilled with commercial pilot ratings who have passed proficiency tests in the flight environment encountered by WS. WS pilots, gunners, and ground crews are trained in hazard recognition and shooting is only conducted in safe environments. Federal aviation regulations require pilots to fly a minimum distance of 500 feet from structures and people, and all employees involved in these operations are mindful of this. Because of the remote locations in which WS conducts aerial operations, the risk to the public from aviation operations or accidents is extremely minimal

Accidents have been associated with WS aerial operations and are a concern to WS. Because accidents have also been a concern to the public, they will be analyzed comparing them to GAV accidents. Accidents included in this analysis include those that occurred from 1996 to 2004, starting prior to the independent review (Table 25). The aviation industry standard for expression of accidents is the number of accidents per 100,000 hours flown. Because Colorado WS flies a low number of hours annually (ave. 801 hrs/year from FY00 to FY04), it is statistically invalid to analyze accidents on a statewide basis. A more appropriate analysis of accidents would look at accidents nationwide during WS predator hunting activities. At the national level, WS hours flown annually have ranged from 13,000 to as many as 19,000, and totaled about 130,000 hours in the 9 year period depicted in Table 25. Therefore, although still relatively low compared to GAV, national level data provide a more appropriate statistical basis for comparison.

Nationwide, WS had an accident rate of 10.8/100,000 (includes some non-low-level flying) compared to an accident rate of 6.9/100,000 for GAV. However, the difference between the WS accident rate and GAV accident rate is statistically insignificant (p=0.19, J. Shivik, WS-National Wildlife Research Center, 2005, pers. comm.). WS in the Western Region had an overall accident rate of about 12.1/100,000 (Table 25). In a separate analysis, WS agency pilots with agency-owned and rented aircraft had an accident rate of 6.2/100,000 hours while WS contract pilots with their own aircraft had an accident rate of 51.7/100,000 hours. To put these into perspective, GAV had an accident rate during the same time of 6.9/100,000 hours. The Department of Interior flies about 100,000 hours annually with a smaller proportion of low-level flying than WS and had an accident rate average of about 8.5/100,000 hours (National Business Center 2004).

GAV has 4 categories of aviation including personal/business, aerial application (includes aerial chemical application (e.g. crop-dusting) and herding (ranching activities)), instructional, and corporate. From 1990 through 1999 GAV had an accident rate of about 8/100,000 (the accident rate is lower now as it dropped below 8 in 1996 and has remained there. Of these categories, aerial application (crop dusting) which is low level flying had a little over 9/100,000 hours and personal/business had the highest with about 11/100,000. Corporate aviation had the lowest accident rate at less than 1/100,000 hours (National Transportation Safety Board 2003). The latter is expected because this category involves larger aircraft, jets, and turboprops associated with highaltitude flying.

Some of WS's accidents have involved pilot error while others are directly related to mechanical failure. Of the accidents between 1996 and 2004, 11 were due to pilot error, 6 were due to mechanical failure, and 1 due to unknown causes. WS built the WS Aviation Training Center with the goal of reducing pilot error accidents to zero. Pilots are being trained to deal more effectively with different types of mechanical failures. WS complies with all Federal Aviation Administration issued Service Bulletins, Airworthiness Directives, aircraft manufacturing recalls, and similar documents. These, though, may not be distributed by the Federal Aviation Administration in a timely manner after a mechanical problem or concern has been identified. Notably, WS has been responsible for notifying the Federal Aviation Administration of 2 discrepancies (identified aircraft problems), one involving turbine engines was issued to the public in an Airworthiness Directive.

Table 25. WS aerial hunting hours in the WS Western Region, WS accidents for 1996-2004 and GAV hours and accidents for 1996-2003.

WS Aviation Accidents Compared to General Aviation										
Year	WS Hours Flown	WS Accidents	CP Hrs Flown	CP Accidents	GAV Hours	GAV Accidents				
1996	14,999	1	1,282	I	24,881,000	1,908				
1997	18,953	0	921	1 (1H)	25,591,000	1,845				
1998	15,910	1	1,182	3 (3H)	25,518,000	1,904				
1999	16,072	0 -	884	1	29,246,000	1,905				
2000	11,836	1	3,688	2 (1H)	27,838,000	1,837				
2001	13,190	0	3,149	I (lH)	25,431,000	1,726				
2002	12,991	1	2,635	0	25,545,000	1,713				
2003	12,573	2 (1H)	2,834	I	25,800,000	1,732				
2004	13,199	2	2,781	0	Not Available	Not Available				
Total	129,723	8 (1H)	19,356	10 (6H)	209,850,000	14,570				
Accident Rate	6.2/100,000 51.7/100,000				6.9/100,000					
WS Acc. Rate	12.1/100,000									

CP - Contract Pilots for WS

GAV - General Aviation

H - Helicopter

The aviation safety program includes regular training for pilots and gunners as well as enhanced pilot training and evaluation. The National Aviation Training Center is beginning to provide pilots with more rigorous training which includes the use of simulators. Fixed-wing aircraft are used more often today than are helicopters. If helicopters are used, they must be turbine powered. WS contract pilots are now being screened more thoroughly and are held to the same training standards as agency pilots to help reduce their accident rate. Additionally, WS is hiring more agency pilots rather than contracting out services. Previously, contract pilots were hired based on the low bid process. This no longer is the SOP. WS must now certify pilots prior to their working for WS. The accidents between 1996 and 2004 involved 11 fixed-wing aircraft and 7 helicopters. Pilot error was involved in 11 of these accidents (the focus of the training center). About half of the accidents, excluding the accident due to unknown causes, were due to mechanical failure and were mostly unavoidable (many of the helicopter accidents involved hard landings as a result of lost power). Thus, accidents may still occur. Four of the accidents resulted in the deaths of 4 WS employees and 2 contract pilots, 3 in helicopters and 3 in fixed-wing aircraft. The last fatality occurred in 2000 with a contract helicopter pilot and the cause of the accident was unknown. Accidents have occurred in all phases of flight from take-off to landing (7 while aerial hunting, 7 while ferrying/surveying, and 4 at take-off or landing). Thus, 40% of the accidents occurred while aerial hunting. None of these accidents occurred in Colorado.

WS concludes that the accident rate is within the norms of aviation and have not involved the general public. WS flight crews understand the risks involved. Risks, though, are considered and expected to remain low. Security measures have been taken to reduce the risk of aircraft theft (post 9/11). Therefore, WS concludes that accidents involving WS aircraft are within the expected norms. WS will continue to strive to further reduce these, thereby minimizing potential risks.

4.1.3.2 Alternative 2 - No Federal WS PDM. Under this alternative, neither WS nor any other federal agency would provide assistance with PDM and, therefore would not have any effect on predator populations. The federal portion of WS would have no effect on public safety, the environment, or "environmental justice and executive order 12898" issues under this alternative. CDA and CDOW would probably still provide some reduced level of PDM without federal supervision. Private efforts to reduce damage would likely increase. Compared to the current program alternative, private individuals would likely increase negative effects on the environment and human safety. This would result from untrained and unlicensed individuals using PDM methods and toxicants, both legal and illegal. As discussed in section 2.3.3, it is possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants with unknown impacts on public safety. In addition, private individuals are not accountable and could conduct PDM legally or illegally. Of the alternatives, Alternative 2 would have the greatest potential for negative impacts on public

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safety, pets, and the environment.

In addition to some of the problems noted above, the federal portion of WS would not be able to respond to predator complaints involving human health and safety. Depending on their level of effort, CDOW may be able to respond in a timely manner. Human health and safety problems associated with predators could increase slightly, but some damage problems could either go unresolved or be handled by private individuals with similar risks described above.

CDA or CDOW could still issue aerial hunting permits to the public. The chance of accidents would likely increase because private pilots would most likely not receive the same level of training as WS pilots and low-level flying has inherent risks associated with it. As can be seen with the accident rates of non-agency pilots, it is expected that more accidents would occur under this Alternative.

- 4.1.3.3 Alternative 3 Technical Assistance Only. Under this Alternative, WS would provide advice or guidance on PDM techniques and methods, but would not conduct any direct operational PDM in attempting to assist in resolving damage complaints. Therefore, WS would not have any impact on predators in Colorado. This Alternative would be almost identical to Alternative 2, except that those people receiving technical assistance would be more apt to conduct PDM with less risk to the public. So this Alternative would have fewer negative consequences than Alternative 2, but more than Alternative 1.
- 4.1.3.4 Alternative 4 Nonlethal Required before Lethal Control. This alternative would require that resource owners use nonlethal techniques prior to WS implementing lethal PDM methods to resolve a damage problem. Most PDM methods with the potential for negative impacts on the physical environment or public safety, such as chemical toxicants, traps, and snares, would be used to a lesser extent by WS under this alternative as compared to Alternative 1. Therefore WS would have less potential for impact on human public and pet safety, and the environment. On the other hand, CDA and CDOW could increase their first response. Private citizens, frustrated by WS, would probably conduct lethal PDM at some reduced level compared to Alternative 2 and 3. As discussed in Alternative 2 and 3, many of these individuals would use PDM methods and registered toxicants. Illegal toxicants might also be used and could adversely impact the environment and public safety. In addition, traps, snares, and firearms used by novices could result in greater adverse effects on public safety and the environment as discussed in Alternatives 2 and 3. WS nonlethal PDM activities would be likely not to have a negative effect on the public concerning "environmental justice and executive order 12898" issues. WS would be able to respond to predator complaints with lethal PDM for incidences involving human health and safety and, therefore, would have the same effect as under the current program alternative. Because WS could not necessarily resolve problems in a timely manner, the effects under this alternative would be greater than under the current program alternative but less than with Alternatives 2 and 3. WS would not conduct as much aerial hunting under this Alternative, so associated risks would be reduced. Private entities may increase aerial hunting, and their risk would be higher than under the Current program Alternative. Thus, this Alternative would have a slightly higher negative impact than Alternative 1, but less than Alternatives 2 and 3.
- 4.1.3.5 Alternative 5 Corrective Control Only When Lethal PDM Methods are Used. Alternative 5 would not allow WS to conduct preventive operational PDM. Therefore, WS would not have any direct impact on public and pet health and safety, or on the environment. Most preventive work in Colorado by WS is focused on areas of historic loss of livestock to coyotes and red fox. Much of this work is conducted with aerial hunting in concert with PDM on the ground. PDM, including aerial hunting, may be implemented in these historic loss areas by individuals with less experience than WS personnel resulting in greater impacts on public and pet safety. However, many private citizens would involve WS after damage had occurred. Therefore, it is believed that fewer would become frustrated to the point of using illegal methods. These increased private PDM activities would lead to potentially similar cumulative impacts as those described under the No Program Alternative, but only for a small portion of the projects. Impacts and hypothetical risks from illegal chemical toxicant use under this alternative would probably be similar to the proposed action or slightly higher. Therefore, it is concluded that public and pet safety, as well as the environment would be at greater risk under Alternative 5, but much less than with Alternatives 2 and 3, similar to Alternative 4, and more than the proposed action, Alternative 1.

4.1.4 Effects of PDM, Especially Aerial Hunting Activities, on the Use of Public Lands for Recreation

Recreation encompasses a wide variety of outdoor entertainment in the form of consumptive and non-consumptive uses. Consumptive uses of public lands include activities such as hunting, fishing, and rock-hounding. Non-consumptive uses include activities such as bird watching, photography, camping, hiking, biking, rock climbing, winter sports, and water sports. Recreationists are members of the general public that use public lands for one of the above or other activities. Recreation on private lands is restricted by landowners and, thus, should not be impacted as much as on public lands. PDM is conducted mostly for the protection of livestock on grazing allotments in these areas. These areas are typically removed from high public-use areas.

4.1.4.1 Alternative 1 - Continue the Current Federal PDM Program. WS is aware that most recreationist concerns regarding PDM center around perceived impacts on hunting, photography, wildlife viewing, and enjoyment of seclusion. The issue was discussed in section 2.3.4 and WS's SOPs were addressed in 3.4.2.4. WS has had only minor, if any, effects on recreational opportunities on public lands. Impacts on recreation such as hunting and non-consumptive uses would be similar to the current program under the 2 EAs (WS 1997b, 1999a) since PDM would be similar to that which was analyzed previously. Measures and SOPs developed to protect recreation resources under the current program would be similarly implemented. However, under this alternative, WS would function based on consistent statewide policies. Impacts on SMAs would continue to be very minimal and would be conducted in response to livestock losses. WS abides by all laws, regulations, rules, and policies for the use of different PDM methods in SMAs as applicable. WS would receive input and advice from BLM and USFS for the WP regarding PDM in SMAs, especially as they relate to concerns that the proposed PDM might represent a conflict with RMPs and LRMPs.

Game and non-game wildlife populations are minimally impacted by WS's take on public lands (Tables 26 and 27) allowing hunters ample opportunities for pursuit. Recreationists interested in wildlife viewing and photography opportunities also have ample areas in Colorado that are suitable for seeing abundant wildlife. Site-specific information is presented in Tables 26 and 27 which give the number of allotments WS conducted PDM on from FY02 to FY04 for BLM and USFS lands in Colorado. WS PDM activities are of low magnitude to animal populations as discussed in Section 4.1.1.1. In fact, WS PDM activities may benefit certain wildlife populations (e.g, PDM focused for the protection of T&E species) thereby increasing viewing/photography opportunities of less abundant species.

A public comment was received expressing that viewing opportunities are diminished at the BLM RA and USFS NF level by WS PDM activity. As the impact analysis showed in Section 4.1.2.1, WS has not impacted predator populations substantially, nor does it on BLM and USFS lands where the public has an opportunity to view or pursue them. Table 26 gives the predators taken for the past 3 FYs on BLM administered Resource Management Areas and Table 27 on USFS NFs. WS has conducted PDM (all available methods including ground and aerial hunting) on 7 of the 11 BLM Resource Management Areas and 7 of the 14 USFS NFs/NGs in Colorado from FY02 to FY04. The proportion of BLM and FS land area where PDM is conducted is minimal statewide (13% and 3%). The most in any RA is 48% (33% aerial hunted) of the lands in Little Snake RA (coinciding with large numbers of sheep grazed) and in Routt NF at 17% (9.8% aerial hunted). Most other RAS, NFs, or NGs have a much less percentage of lands with PDM of the lands under grazing. WS does not anticipate that this acreage will increase substantially because PDM is conducted on allotments where cooperative funding is provided. However, WS anticipates that new allotments will be worked and some will no longer have PDM conducted on them.

Table 26. Target species (no nontargets) taken, and area and number of allotments worked by WS Specialists from FY02 to FY 04 on BLM lands in Colorado.

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	S	pecies Taker		Y Town to the late of the	l) in Colorado	from FY (02 to FY04		gas jandil
		1		LM Resource		0 7		n=	
		Little Snake	White River	Glenwood	Uncompahere	Gunnison	Grand Jet	Other*	Total
		11	T	П	PDM Activity	II 	II	1	1
Grazing Lands (1	2.115	2.254	879	1,380	957	1.999	2.983	12,567
Lands with PDM	FY02	1,167	403	30	136	13	-	19	1,768
(ıni²)	FY03	899	639	24	82	5	181		1,830
	FY04	998	328	9	40	-	-	-	1,375
	Ave	1,021	457	21	86	6	60	6	1,658
Ave PDM Land %	% RA	48%	20%	2%	6%	1%	3%	0%	13%
Total Allotments		352	142	197	220	107	218	942	2,178
Active Allot, 20	005	243	117	156	161	83	157	688	1,605
Allotments with	FY02	32	16	3	10	2	-	1	64
PDM	FY03	27	27	2	6	1	3	-	66
	FY04	25	11	3	5	<u> </u>	-		44
	Ave	28	18	3	7			0	58
Ave, PDM Allot.% of Total		8%	13%	1%	3%	1%	0%	0%	3%
Ave PDM Allot % Active		12%	15%	2%	4%	1%	1%	0%	4%
	11				TAKEN IN PD	11			
Species	FY	Killed	Killed	Killed	Killed	Killed	Killed	Killed	Total
Coyote	02	212	111	3	18	2	-	-	346
	03	113	81	9	23	1	7	-	234
	04	192	123	2	17	-	-	-	334
	Ave	172	105	5	19		2	0	305
Black Bear	02	1	-	-	3		-	-	4
	03	<u> </u>		 				-	0
	04	-	-	- 0	-	- 0	- 0	0	0
D. I	Ave	0	0	<u> </u>					0
Bobcat	02	<u> </u>	-	· · ·		 	-	, -	1
	03	<u> </u>	1		-	-	-	-	0
	Ave.	0	0	0	0	0	0	0	0
Red Fox	02	1	-	-	-	-		-	1
	03	-	-	-	-	-	-	-	0
	04	1	-	-	-	-		-	1
. lì	Ave		()	0	0	0	0	0	

^{*} Also Includes Kremmling, Royal Gorge, La Jara, and Saguache RAs, and San Juan Land Center (WS does not currently work on grazing allotments in these RAS except 1 in La Jara).

Table 27. Target species (no nontargets) taken, and area and number of allotments worked by WS Specialists from FY02 to FY 04 on USFS lands in Colorado.

4 H-2	4 6		S DEMONSTRATE	CAL DIDAY	Herea	1 . 6 .			1-
Allot	ments, S	pecies Taker	i, and Area	with PDM o	Averaging the Third Colonians	ids in Colora	do from FY	02 to FY04	
		Comanche	GMUG	Rio Grande	Annual Company of the	San Juan	NAME OF THE REAL PROPERTY.	Other NF*	Total
		<u> </u>	THE ACCOUNT OF THE PARTY OF THE	G Statistics ar	Declaration of the second		MANIME VIACE	Other IVE	<u>ji rotai</u>
NF (mi ²)		700	4,940	2,900	2,300	3,900	3,600	5694	23,334
Grazing Lands (mi²)	646	4,344	2,407	1,462	3.144		i	
Lands with PDM	FY02	63	57	2,407	238	90	2,285 102	2,793	16.435 578
(mi ²)	FY03	47	5	- 20	226	<u> </u>	 		ļ
	<u> </u>			-	<u> </u>	72	83	-	433
	FY04	70	34		281	72	93	<u> </u>	550
	Ave	60	32	9	248	78	93	0	520
Ave PDM % Graziı	ng Land	9%	1%	0%	17%	2%	4%	0%	3%
Total Allotmer	its	352	142	197	220	107	218	942	2,178
Active Allot. 20	005	243	117	156	161	83	157	688	1,605
Allotments with	FY02	2	4	2	34	2	14	-	56
PDM	FY03	2	. 1	-	30	5	10	-	46
	FY04	3	3		39	5	13		60
	Ave	2	3	1	34	4	12	0	54_
Ave. PDM Allot.%	of Total	1%	2%	0%	16%	4%	6%	0%	2%
Ave PDM Allot %	Active	1%	2%	0%	21%	5%	8%	0%	3%
# Allotments 12	297	197	195	121	139	176	135	489	1.255
				TARGET SI	PECIES				
Species	FY	Killed	Killed	Killed	Killed	Killed	Killed	Killed	Total
Coyote	02	16	2	0	100	0	60	-	178
	03	2	2	-	57	10	58	-	129
	04	0	13	-	115	2	67	-	197
	Ave	6	6	0	91	4	62	0	168
Black Bear	02	N/A	2	N/A	7	-	1	-	10
·	03	N/A	-	N/A	-	1	-		1
	04	N/A	-	N/A	1	-	1		2
D I E	Ave	0	l l	0	3	0	l l	0	4
Red Fox	02	-	-		-	-	-	<u> </u>	0
	03	-	-	-	- 1		-		0
	04 Ave		- 0	- 0	1	- 0	- 	-	1

^{*} Includes Arapaho, Roosevelt, San Isabel, and Pike NFs and Pawnee NG GMUG = Grand Mesa, Uncompaniere, and Gunnison NFs

On Federal lands, WS coordinates with the land management agency through WPs and designates different work zones on maps to reduce potential problems. For example, high-use recreational areas are identified and avoided when WS conducts PDM actions. Furthermore, upland game and other high-use hunting areas are delineated by CDOW, USFS, or BLM. If WS works in these areas, control equipment is removed a week or more prior to the hunting season as appropriate. WS does not conduct PDM in high-use recreational areas except for the purposes of human health and safety protection. High use recreation and other sensitive areas are identified at the site specific level on WS WP maps which are modified as new damage situations arise. Human safety zones, planned control areas and restricted or coordinated control areas are identified through interagency communications.

Furthermore, WS reduces conflicts with recreationists due to the inherent features of PDM. WS conducts PDM on public lands almost entirely for protection of sheep and cattle on grazing allotments. Many of these areas are generally not used extensively by recreationists. Most recreational areas are set aside for that specific purpose and grazing is not allowed. The highest seasonal PDM activity for the protection of livestock coincides with lambing and calving which is mostly in the spring (although some calving may occur in the fall). During this time, aerial hunting is the method of choice because many of the grazing areas allow poor access and driving conditions are usually limited by wet or snow covered roads. Many recreationists, as well as WS Specialists, do not have access to these public lands due to these limitations. In addition, WS currently averages only 10 and 12 minutes of flight time per square mile annually on the small proportion of BLM and USFS lands flown, respectively (Table 28). On a land area basis, WS aerial hunts 10% of the BLM lànds, 1% of the USFS lands, and 1% of the remaining public and tribal lands in Colorado. Therefore, the vast majority of public lands are not exposed to WS aerial hunting. Most recreationists are totally unaware of PDM actions and the quality of their outdoor experience is not compromised. Thus, WS has little impact on most recreation and nonconsumptive uses.

Table 28. The number of hours spent aerial hunting different land classes in Colorado.

	Time	Spent Aeria	l Hunting Differ	ent Land Cla	isses in Colorad	o from FY00	to FY04	
Fiscal	Private		BLM		USFS		Other	
Year	Acres	Hours	Acres	Hours	Acres	Hours	Acres	Hours
FY00	1,944,697	735	922,697	215	295,260	53	231,400	18
FY01	1,778,160	705	1,060,250	265	114,390	47	0	0
FY02	2,218,220	778	796,319	260	176,560	62	25,000	45
FY03	1,573,273	538	812,078	145	94,767	39	30,041	9
FY04	1,398,232	610	686,364	184	114,131	43	5,000	1
Ave.	1,782,516	673	855,542	214	159,022	49	58,288	15
min/mi²	15		10 12 10					
All lands a	Il lands ave. min/mi ²							

WS recognizes that some individuals interested in SMAs may feel that any PDM activities in these areas adversely affect their aesthetic and natural qualities, value, and the ecosystem. The different SMAs were discussed in Section 2.2.4. WS abides by all associated laws, regulations, and policies (e.g., the Wilderness Act) to minimize any effect on the public while conducting PDM as allowed to reduce damage in the SMAs. Many SMAs allowed grazing long before being designated as such and PDM has historically been conducted on many of these areas (typically for as long as grazing has been allowed). However, WS conducts PDM on only a few SMA grazing allotments for the protection of livestock. The current program alternative has a minimal effect on BLM and USFS SMAs such as WAs, WSAs, campgrounds, research natural areas, trailheads, and National Conservation Areas. WS complies with WS guidelines and policies when conducting PDM in these areas. Current laws and regulations allow the public and WS to conduct PDM activities in SMAs under certain limitations. In the last two FYs, WS only conducted PDM on two WAs (both short-term projects for a bear and a coyote) and one National Conservation Area at the request of CDOW.

Sections 2.3.7 and 3.4.2.7 discuss the issue of WS PDM activity in SMAs such as WAs and WSAs and WS's SOPs to ensure no adverse effects in SMAs. PDM is only conducted in designated WAs or WSAs when allowed by the legislation that designated the WA, or under regulations and, where applicable, policies developed by USFS or BLM for PDM in these areas. PDM in SMAs is only a very minor component of the current program. Currently, private individuals using firearms and trail hounds can sport hunt or conduct PDM in most WAs and WSAs. These activities are not restricted and are allowed by BLM, USFS, or CDOW regulations.

4.1.4.2 Alternative 2 - No Federal WS PDM. Under this alternative, neither WS nor any other federal agency would provide assistance with PDM and, therefore would not have any effect on recreation. The federal portion of WS would not have any impact on hunting and nonconsumptive uses. CDA and CDOW would probably provide some level of direct PDM assistance. State-conducted PDM would similarly affect recreation as described under the current program alternative, except that (with no federal participation) overall impacts would decrease proportionately to the likely decreased effort provided by State programs. Private efforts to reduce or prevent depredations would likely increase. This could result in less experienced persons implementing PDM methods leading to a greater impact on recreation than described under the current program alternative. As discussed relevant to other issues, it is possible that the frustration caused by the inability of less experienced persons implementing PDM to reduce losses could lead to the illegal use of chemical toxicants which, in turn, could impact recreationists and their pets. This activity could also have minor impacts on game species, as described for predators in 4.1.1.2 and nontarget species in 4.1.2.2. Aerial hunting would probably not be used as much under this alternative because it requires pilots experienced with low level flying and a permit from CDA or CDOW. Therefore, recreationists would be minimally affected by this PDM method. Even if CDA and CDOW issued several more permits, the effects (barring illegal activities) would likely be similar to those in section 4.1.4.1. PDM activities by others may cause damage to the environment from off-road vehicle use where WS would normally aerial hunt. This is because much of the environment is sensitive to disturbance and vehicles can leave long-lasting scars, especially when vehicles are used during the wet season. These scars can be an eyesore to recreationists. Therefore, it is likely that slightly greater negative impacts could occur under this alternative when compared to the current program, as discussed in section 4.1.4.1.

The current program has been determined to have minimal effects on the SMAs. Therefore, the same program reduced by the federal component would similarly not affect SMAs. Without a federal program to provide assistance, individuals affected by predator damage could conceivably have a negative effect on SMAs under this alternative, for the same reasons described elsewhere with no program. This alternative would likely have a greater negative effect on SMAs than would the current program alternative.

4.1.4.3 Alternative 3 - Technical Assistance Only. Under this alternative, WS would only provide advice or guidance on PDM techniques and methods. WS would not conduct any direct operational PDM in attempting to assist in resolving damage complaints, and therefore, would not have any impact on recreational use of public lands in Colorado. This Alternative would cause many of the same problems discussed in Section 4.1.4.2, although at a reduced level because those people receiving advice could make wiser choices when conducting PDM on public lands. However, this alternative would result in slightly greater negative impacts on recreation than would the proposed action. Impacts to SMAs would likely be minimal, but would likely be greater than under the Current Program Alternative.

4.1.4.4 Alternative 4 - Nonlethal Required before Lethal Control. WS would minimally affect recreationists with the Nonlethal before Lethal PDM Alternative. In areas where nonlethal control had already been implemented and found to be ineffective, the full array of PDM methods could be used. Effects of PDM would likely be considered minimal to recreationists as discussed in section 4.1.4.1. However, some individuals would implement lethal control on their own because WS might seem unresponsive. This could have adverse effects on recreationists as discussed relative to Alternatives 2 and 3. The effects on recreation under Alternative 4 would probably be somewhat less, but more than the effects discussed for Alternative 1. Impacts on SMAs under this alternative would be similar to the current program, Alternative 1. Although the effectiveness may not be as high as the current program, this alternative would allow the use of all methods eventually. Some producers may cause problems in SMAs similar to those listed for Alternatives 2 and 3, but at a much reduced rate since coordinated assistance would still be available.

4.1.4.5 Alternative 5 - Corrective Control Only When Lethal PDM Methods are Used. WS would minimally affect recreationists with the Corrective Control Only Alternative (similar to Alternative 1). In areas where preventive control would have been used by WS under Alternative 1, PDM could be implemented by resource owners. Resource owners implementing PDM could have an effect on recreationists, but impacts would be minimal compared to Alternatives 2 and 3. However, some of these impacts may be prevented with nonlethal methods. Under Alternative 5, aerial hunting would be used less because it is the most commonly used preventive method used that is perceived to impact SMAs. The most typical method that would be prevented from being used would be aerial hunting coyotes prior to lambing and calving. Much more effort would be expended following losses with PDM on the ground and aerially and more losses would be incurred by the resource owner as has been shown (Wagner 1997, Wagner and Conover 1999). Resource owners conducting their own preventive PDM would have similar impacts as those described under Alternative 2 and 3, but for WS PDM activities would be closer to Alternative 1.

4.2 SUMMARY AND CONCLUSION

The current program had the lowest overall negative environmental consequences combined with the highest positive effects, and is, therefore, the preferred alternative (Table 29). The environmental impacts of implementing PDM correspond with those raised and discussed in detail in Chapter 4 of USDA (1997). Impacts associated with activities under consideration in this EA are not expected to be "significant." Based on experience, impacts of the PDM methods and strategies considered in this document are very limited in nature. The addition of those impacts to other associated impacts of past, present, and reasonably foreseeable future actions would not result in cumulatively significant environmental impacts. Monitoring the impacts of WS PDM activities on populations of both target and nontarget species would continue. All PDM activities that may take place would comply with relevant laws, regulations, policies, orders, and procedures (including the ESA, Migratory Bird Treaty Act, and FIFRA). This EA will remain valid until WS and other appropriate agencies determine that new actions or new alternatives, having substantially different environmental effects, must be analyzed. Change in environmental policies, the scope of the project, or other issues may trigger the need for additional NEPA compliance. This EA would be reviewed periodically for its continued validity.

Table 29. A summary of the environmental consequences of each program alternative relative to each issue.

A	Relative Compariso	n of the Overall	Effects on Speci	es and Issues as	Related to the	Alternatives
Issue No.	Issues/ WS Impacts	Alternative I Current Program	Alternative 2 No Federal Program	Alternative 3 Nonlethal	Alternative 4 Nonlethal before Lethal	Alternative 5 Preferred Modified
	Coyote	0	0	0	0	0
	Red Fox	0	0	0	. 0	0 -
	Striped Skunk	0	0	0	. 0	0
1	Raccoon	0	0	0	0	0
	Mountain Lion	0	÷ .	-	0	0
	Other	0	-	-	0	0
,	Nontarget Species	0	/0	/0	-/0	-/0
2	T/E Species	-/+ +	/0	/0	-/+	-/+
3	Public safety	-/+			-	-
4	Recreation	0			-	0
	Sp. Mgmt. Areas	0			•	0

Summery ratings of impacts: "--" = High Negative; "-" = Low Negative; "0" = None; "+" = Low Positive; and "++" = High positive. Note: While a control action or removal might have a negative effect on that individual animal or issue, removing the individual predator could also have a positive effect on it's prey species.

5.0 CHAPTER 5 - LIST OF PREPARERS, PERSONS CONSULTED, AND LITERATURE CITED/REFERENCES

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